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THE

BRITISH JOURNAL

Photographic Almanac

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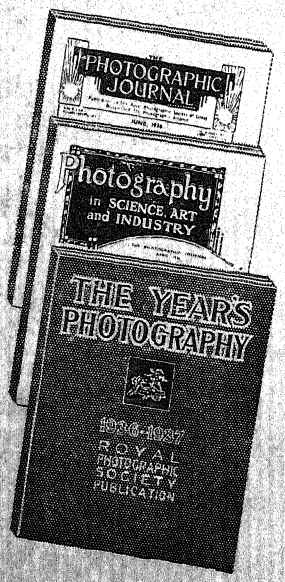
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Photography in Science, Art and Industry

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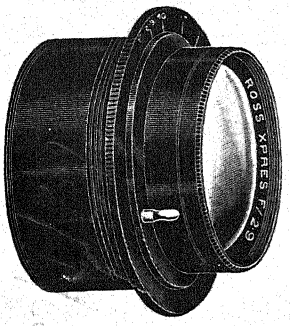
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THE ROSS XPRES LENS

These lenses are the finest examples of modern most ultra rapid lenses. Cinematograph, Reflex, Focal Plane and Press Photographers will find them invaluable. A distinctive feature of F/3.5 lens is its wide angle of view.

PRICES
ROSS XPRES LENS, *f*/1.9

Equiv. Focus		Plate Covered	Flange Size	In Iris Setting	Code Word Iris Setting	Flange Size	In Focussing Jacket	Code Word Focussing Mounts
mm.	in.	mm.	in.	£ s. d.		in.	£ s. d.	
25	1	16×12	1⅛	10 0 0	Yeda	1⅜	11 0 0	Yedafo
		in.						
38	1½	1 × ¾	1¼	10 10 0	Yefe	1⅝	12 0 0	Yefefo
50	2	1 × 1¼	1¾	11 0 0	Yegi	1⅝	12 15 0	Yegifo
75	3	2⅝ × 1¼	2	13 0 0	Yeho	2¼	15 0 0	Yehofo

ROSS XPRES LENS, *f*/2.9

Equiv. Focus		Plate Covered	Price Iris or Sunk Setting	Code Word Iris Setting	Price in Focussing Mounts	Code Word Focussing Mounts
mm.	in.	in.	£ s. d.		£ s. d.	
25	1	16×12 mm.	8 10 0	Zuabo	—	—
50	2	1×¾	9 0 0	Zuace	10 10 0	Zuaec
62	2½	1×1¼	9 15 0	Zuadi	11 5 0	Zuaid
75	3	2⅝×1⅜	10 10 0	Zuafo	12 0 0	Zuaof
144	5⅝	3½×2½ & 4¼×3¼	15 10 0	Zubai	18 0 0	Zubia
165	6½	4¼×3¼ & 5 ×4	17 10 0	Zucem	21 0 0	Zucme
215	8½	5 ×4 & 6½×4⅜	25 0 0	Zudin	—	—
254	10	6½×4¾	35 0 0	Zufop	—	—

ROSS XPRES LENS, *f*/3.5

Equiv. Focus		Plate Covered	Price in Iris or Sunk Setting	Code Word Iris Setting	Price in Focussing Mounts	Code Word Focussing Mounts
mm.	in.	in.	£ s. d.		£ s. d.	
38	1½	1 × ¾	6 10 0	Zabse	7 12 6	Zebune
50	2	1 × 1¼	6 10 0	Zenar	7 12 6	Zecto
75	3	1¼×1	7 10 0	Zecuno	8 12 6	Zoton
90	3½	2⅜×1⅝	8 0 0	Zecupa	9 10 0	Zotup
100	4	2⅝×1¾	9 0 0	Zedan	11 0 0	Zedna
112	4⅜	3¼×2⅛	10 0 0	Zefep	12 5 0	Zefpe
136	5⅜	4¼×3¼	11 10 0	Zegir	13 15 0	Zegsi
152	6	4¼×3¼	12 15 0	Zehos	15 5 0	Zehfto
165	6½	5 ×4	14 0 0	Zejut	—	—
184	7¼	5½×3½	16 0 0	Zekav	—	—
254	10	6½×4⅜	30 0 0	Zelew	—	—

In sunk settings for Reflex Cameras at same price as ordinary mounts.
The Special Focussing Mounts are for Hand Cameras of fixed extension.
These special mounts do not admit of between-lens Shutters.
Cost of pairing lenses for Stereoscopic work, 15/-.

ROSS LTD. CLAPHAM COMMON LONDON, S.W.4



THE ROSS XPRES LENS

The Ross Xpres F/4.5 lens combines extreme speed with a quality of definition unequalled in lenses of the same aperture. Its critical definition at full aperture is maintained over the whole of the plate. Faults usually associated with similar lenses such as Ghost, Flare and Coma are totally absent.

PRICES
ROSS XPRES LENS, *f*/4.5

Equiv. Focus		Plate Covered	Price in Iris or Sunk Setting	Code Word Iris Setting	Price in Focussing Mounts	Code Word Focussing Mounts
mm.	in.		£ s. d.		£ s. d.	
75	3	2 5/16 × 1 3/4	6 5 0	**Xasal**	—	—
90	3½	3¼ × 2¼	6 5 0	**Xama**	—	—
105	4⅛	3¼ × 2½	7 0 0	**Xanaf**	—	—
112	4⅜	3⅝ × 2½	7 0 0	**Xapel**	8 15 0	**Xeptre**
120	4¾	3½ × 2⅝	7 0 0	**Xalas**	8 15 0	**Xartra**
127	5	4 × 3	7 10 0	**Xaqes**	—	—
136	5⅜	4¼ × 3¼	7 10 0	**Xeros**	9 10 0	**Xestree**
140	5½	4¼ × 3¼	7 10 0	**Xemes**	9 10 0	**Xemtred**
152	6	5 × 4	8 10 0	**Xines**	10 15 0	**Xintrop**
165	6½	5¼ × 3¼	10 0 0	**Xopos**	12 5 0	**Xoptemp**
184	7¼	6½ × 4¾	11 0 0	**Xugus**	13 10 0	**Xuqtrowp**
215	8½	7 × 5	14 10 0	**Xares**	—	—
254	10	8 × 5	20 0 0	**Xesis**	—	—
305	12	8½ × 6½	29 0 0	**Xitos**	—	—
360	14	10 × 8	40 0 0	**Xusic**	—	—
420	16½	10 × 8	50 0 0	**Xovus**	—	—
533	21	12 ×10	75 0 0	**Xuras**	—	—

In sunk settings for Reflex Cameras at same price as ordinary mounts.
The Special Focussing Mounts are for Hand Cameras of fixed extension.
These special mounts do not admit of between-lens Shutters.
Cost of pairing lenses for Stereoscopic work, **15/-**.

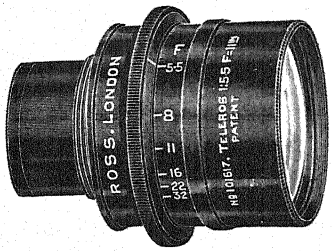
THE *f*/4 WIDE ANGLE ROSS XPRES LENS

The angle embraced by this lens is 70° and the definition is maintained from centre to margin at full aperture. Designed for special aerial surveying, it is eminently suitable for all classes of work where critical definition together with large aperture and great covering power are required.

Equiv. Focus	Plate Covered at Full Aperture	Price	Code Word Iris Setting	Code Word In Special Mounts with Long Screw threads and Clamping Flanges
in.	in.	£ s. d.		
4	4¼ × 3¼ or 5 × 4	12 0 0	**Wads**	**Wadaf**
5	5 × 4 or 5 × 5	14 0 0	**Wafs**	**Wafaf**
6	6½ × 4¾	15 10 0	**Wags**	**Wagaf**
7	7 × 7 or 8 × 5	21 0 0	**Wais**	**Waaf**
8¼	9 × 7	24 10 0	**Wals**	**Walaf**
10	10 × 8	33 0 0	**Wams**	**Wamaf**
12	12 × 10	46 0 0	**Waps**	**Wapaf**
14	15 × 12	67 0 0	**Wars**	**Waraf**
20	22 × 18	125 0 0	**Wass**	**Wasaf**

ROSS LTD. **CLAPHAM COMMON** **LONDON, S.W.4**

THE ROSS TELEROS LENSES



These lenses can definitely be claimed to be the finest of their type. The Teleros F/5.5 (Two Power) and F/6.3 (Three Power) give an image rather more than twice or three times as large respectively as that of an ordinary lens from the same viewpoint. Giving critical definition they are perfect for high speed photography of inaccessible objects and those difficult to approach.

PRICES
ROSS TELEROS LENS, *f*/5.5
(Two Power)

Equiv. Focus	Size Plate	Flange Inside dia.	Length Over-all	Infinity Back Cell to Screen	Back Cell to Flange	Price in Iris Setting	Code Word
in.		in.	in.	in.	in.	£ s. d.	
6¼	2 5/16 × 1 3/4	1 1/4	1 15/16	3 1/4	1/2	10 0 0	Tilau
9	3 5/8 × 2 1/2	1 5/8	2 7/16	4 1/2	1/2	11 10 0	Tilba
11	4 1/4 × 3 1/4	1 7/8	3 3/16	5 3/16	1 1/16	14 0 0	Tilce
12	5 × 4	1 7/8	3 3/16	5 3/16	1 1/16	15 5 0	Tildi
13	5 1/4 × 3 1/4	2	3 7/16	5 7/16	1 1/16	16 15 0	Tilfo
17	6 1/2 × 4 3/4	2 1/4	4 3/4	8	1 5/8	27 10 0	Tilgu
22	8 1/2 × 6 1/2	3	6 1/2	10	2 1/4	47 0 0	Tilhe
40 *f*/8	8 1/2 × 6 1/2	3 3/4	10 3/8	20	3 3/16	85 0 0	Tilji

Mounted in Focussing Settings.

Equiv. Focus	Flange Sizes	Price	Code Word
in.	in.	£ s. d.	
*4	1 1/2	8 10 0	Tilica
6¼	1 5/8	12 10 0	Tilaus
9	1 3/4	14 0 0	Tilhas
11	2	17 10 0	Tiljes
12	2 1/4	18 15 0	Tilkis
13	2 1/2	20 5 0	Tillos

Teleros Lenses in Iris Settings with threaded back cells for screwing into shutters.

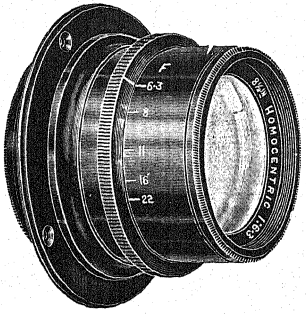
Equiv. Focus	Compur
in.	
6¼	No. 00-0
9	,, 0S
11	,, 1S
12	,, 1S
13	,, 2·4/1
17	,, 3·6/1

* In Leica Setting, complete with hinged finder mask.

ROSS TELEROS LENS, *f*/6.3
(Three Power)

Equi. Foc.	Plate Covered	Flange Inside Dia.	Length Over-all	Infinity Back Cell to Screen	Back Cell to Flange	Price in Iris Setting	Code Words	Shutters Suitable
in.	in.	in.	in.	in.	in	£ s. d.		
9	2 1/2 × 1 3/4	1 1/4	3 3/16	3 3/16	1/2	11 10 0	Triras	1 Compur
13	3 1/2 × 2 1/2	1 1/2	4 1/2	4 5/8	1/2	14 10 0	Triret	2/5 ,,
17	4 1/2 × 3 1/4	2	5 7/8	6 7/16	1 1/16	22 0 0	Trirriu	4 compound
25	6 1/2 × 4 3/4	2 3/4	8 1/2	8 15/16	1 5/8	47 0 0	Trirov	5 ,,

Prices in focussing settings on application.



THE ROSS HOMOCENTRIC LENSES

The Homocentric Lenses are excellent anastigmats, suitable for practically all branches of photography. The smaller sizes are most popular for small hand cameras. The single components of the F/6.3 and F/8 lenses give very good results with a medium stop.

PRICES

ROSS HOMOCENTRIC LENS, *f*/6.3

Equiv. Focus		Plate Covered: Full Aperture	Plate Covered: Medium Stops	Flange Sizes	Price in Iris Setting	Code Word
mm.	in.	in.	in.	in.	£ s. d.	
127	5	4¼ × 3¼	5 × 4	1⅛	**5 10 0**	**Heath**
140	5½	4¼ × 3½	6 × 5	1⅛	**5 15 0**	**Hebra**
152	6	5 × 4	6½ × 4¾	1⅛	**6 2 6**	**Hector**
165	6½	5½ × 3¾	7 × 5	1⅛	**6 12 6**	**Hecat**
178	7	6½ × 4¾	7½ × 5	1⅛	**7 2 6**	**Hedon**
218	8½	7½ × 5	8½ × 6½	2	**9 2 6**	**Heeg**
254	10	8½ × 6½	10 × 8	2¼	**12 15 0**	**Hefra**
305	12	10 × 8	12 × 10	2¾	**18 15 0**	**Hegron**
380	15	12 × 10	15 × 12	3½	**26 5 0**	**Hehlor**

ROSS HOMOCENTRIC LENS, *f*/8

Equiv. Focus		Plate Covered: From	Plate Covered: To	Flange Sizes	Price in Iris Setting	Code Word
mm.	in.	in.	in.	in.	£ s. d.	
178	7	6½ × 4¼	8½ × 6½	1½	**6 15 0**	**Hida**
218	8½	7½ × 5	10 × 8	1¾	**8 5 0**	**Hiendel**
254	10	8½ × 6½	12 × 10	2	**11 0 0**	**Hiffar**
305	12	10 × 8	15 × 12	2¼	**15 0 0**	**Higor**
380	15	12 × 10	18 × 16	2¾	**20 0 0**	**Hihone**
455	18	13 × 11	22 × 18	3¼	**28 0 0**	**Hikur**
533	21	15 × 12	25 × 22	3¾	**37 0 0**	**Hileh**
610	24	18 × 16	30 × 24	4	**47 0 0**	**Himal**

Special Focussing Mounts, provided with Iris Diaphragms, are supplied at a small extra cost for use with Cameras of fixed extension. These special mounts do not admit of between-lens shutters.

Cost of pairing two Lenses for Stereoscopic Work, **15/-**

ROSS LTD. CLAPHAM COMMON LONDON, S.W.4



THE ROSS PROCESS XPRES LENS AND REVERSING PRISMS FOR LINE, HALF-TONE AND THREE-COLOUR WORK.

The Process Xpres Lens has been specially designed to meet the most exacting requirements of all branches of modern process work. It is unrivalled for three-colour photography and the finest line and half-tone work.

PRICES

Focus		Aperture	Plate covered at full aperture copying same size	Price	Code Word	Prism No.
mm.	in.			£ s. d.		
330	13	F/9	13× 9	**15 0 0**	**Phaba**	1
406	16	F/10	15×12	**20 0 0**	**Phace**	1a
460	18	F/10	18×13	**24 0 0**	**Phadi**	2
530	21	F/10	20×16	**28 0 0**	**Phafo**	3
635	25	F/10	25×18	**38 0 0**	**Phagu**	4
760	30	F/16	30×20	**48 0 0**	**Pheha**	4
914	36	F/16	36×24	**68 0 0**	**Pheje**	5
1066	42	F/16	40×30	**87 0 0**	**Pheli**	6
1130	48	F/16	45×36	**110 0 0**	**Phemo**	6

If a Lens is required with a Reversing Prism add the letter "P" to code-word for Lens.

ROSS REVERSING PRISMS for Photo-Mechanical Work

These Prisms are made of carefully annealed colourless crown glass and are accurately rectangular. The mount of the Prism screws directly to the hood of the lens bringing one of the non-reflecting surfaces close up to the front lens. The Prism is thus used to full advantage. The Hypotenuse surfaces are silvered to ensure complete reflection. To obtain accurate centering it is necessary to send your lens when ordering.

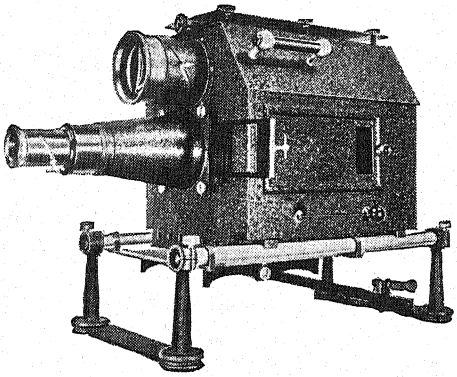
PRICES of Prisms mounted in Metal Box with revolving collar.

No.	Length and Breadth of non reflecting surfaces		Price	Code Word
	in.	mm.	£ s. d.	
1	2½	65	**18 0 0**	**Promote**
1a	2¾	70	**22 0 0**	**Promost**
2	3	75	**26 0 0**	**Promont**
3	3¼	80	**30 0 0**	**Promove**
4	3½	90	**38 0 0**	**Prompt**

Prices for Apochromatic Lens of similar foci for colour work and Prisms of larger size on application.

ROSS LTD. CLAPHAM COMMON LONDON, S.W.4

THE ROSS EPIDIASCOPE



THE vast experience of Ross Ltd. has enabled them to produce a most efficient Epidiascope at a reasonable price, and embodying many exclusive features which place this instrument in a class by itself.

The lenses are of the finest optical quality and give perfect definition. A new system of illumination and ventilation enables the most valuable and delicate specimens to be shown without fear of damage by heat.

Opaque objects and lantern slides are projected with equal brilliance, whilst the placing and withdrawing of opaque objects is most easily effected.

The change over from episcopic to diascopic projection is very simple and effected almost immediately.

A metal pointer with universal adjustment allows the lecturer to draw attention to any part of the object shown whilst still operating the instrument.

When the instrument is tilted, critical definition is easily secured by the adjustment of a screw on the front of the Lamphouse.

THE PRICE

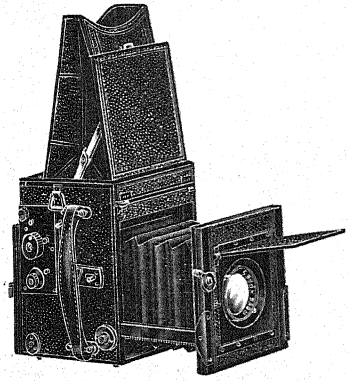
"Ross" Epidiascope with Condensers, Mirrors, 10½ ins. focus large aperture diascopic and 17 ins. ditto episcopic projection lenses, Slide Carrier for either English or Continental size lantern slides, Table Stand, complete but without projection Lamp is

£35 10 0

Extra for: 500-Watts Lamp £1 5 0
1000-Watts Lamp £1 12 0

Descriptive and illustrated booklet sent post free on application.

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THE ROSS STANDARD REFLEX CAMERA

This camera is of the highest quality and best workmanship throughout. It is fitted with every adjustment necessary for the finest reflex work but has no elaborate and unnecessary movements to complicate the working of the camera and get out of order.

Among several special features is the focal-plane shutter. With this shutter the various speeds are obtained by simply altering the width of the slit.

Complete details and specification on application.

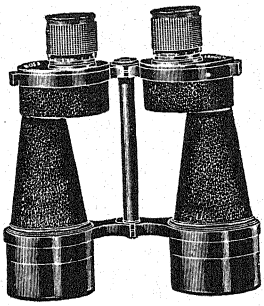
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	3½×2½ 5 in. lens	½-plate 5½ in. lens	Post-card Size 6 in. lens	5½×3½ with Stereo attachment and 2 5 in. lenses	5×4 6 in. lens	½-plate 8½ in. lens
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Camera with 3 Solid Slides, no lens	**23 10 0**	**23 10 0**	**27 0 0**	**30 0 0**	**30 0 0**	**40 0 0**
With Ross Xpres, f/2.9	5⅝″ lens **39 0 0**	6½″ lens **41 0 0**	—	—	—	—
Code Words	**Minilex**	**Refbex**	—	—	—	—
With Ross Xpres, f/3.5	5⅝″ lens **35 0 0**	6½″ lens **37 10 0**	6½″ lens **41 0 0**	—	7¼″ lens **46 0 0**	10″ lens **70 0 0**
Code Words	**Minimop**	**Refjut**	**Refjas**	—	**Refkav**	**Refliy**
With Ross Xpres, f/4.5	4¾″ lens **30 10 0**	— **31 0 0**	6½″ lens **37 0 0**	— **45 15 0**	6½″ lens **40 0 0**	— **54 0 0**
Code Words	**Minleg**	**Refule**	**Refews**	**Reflock**	**Refnok**	**Refnole**
With Ross Homocentric Lens, f/6.3	**29 0 0**	**29 5 0**	**33 2 6**	**41 15 0**	**36 2 6**	**49 2 6**
Code Words	**Miniflap**	**Reflap**	**Refiate**	**Refster**	**Refloor**	**Refloat**
Solid D.D. Slides, each	**0 15 0**	**0 15 0**	**0 18 6**	**0 18 6**	**0 18 6**	**1 7 6**
Book-Form Slides, each	**1 10 0**	**1 10 0**	**2 0 0**	**2 0 0**	**2 0 0**	**2 10 0**
For Swing Front, extra	**3 8 6**	**3 8 6**	**3 15 0**	**3 15 0**	**4 5 0**	**4 15 0**
Changing Box for 12 plates	**4 5 0**	**4 5 0**	**5 0 0**	**5 0 0**	**5 0 0**	**5 17 0**
Film-pack Adaptor	**1 15 0**	**1 15 0**	**2 2 6**	**2 2 6**	**2 2 6**	**2 16 0**
Antinous Release, extra	**0 5 6**	**0 5 6**	**0 5 6**	**0 5 6**	**0 5 6**	**0 5 6**

New Shutter Release Time Valve, 40/-.
Stereo Focussing Magnifier, fits hoods of all cameras, £1 1s. 0d.
The post-card size cameras are not fitted with reversing back.
Leather Cases for any outfit to order.
Prices for Continental sizes post free on application.

ROSS LTD. CLAPHAM COMMON LONDON, S.W.4

ROSS EXTRA WIDE FIELD



STEREO PRISM BINOCULAR

MAGNIFICATION 7 DIAMETERS "STEPNITE"

"STEPNITE" has been specially designed for use at dusk and for observation at night.

The light transmitting power is very greatly in excess of that of any prism binocular previously made, and by reason of large prisms and lenses and eyepieces of special design, the illumination at margins of field is 137 per cent. greater than that obtained with other binoculars of the same power and aperture. Further, the central illumination is fully 20 per cent. greater and the perfect definition is maintained over practically the whole field, whereas in other types of binoculars the definition falls off rapidly towards the margins of field. These qualities of great luminosity and critical definition at margins of field make this binocular unsurpassable for the use of officers of the Navy and Mercantile Marine, Yachtsmen, Huntsmen, Sportsmen, Surveyors and others.

With "Stepnite" objects can be picked up and clearly seen immediately they enter the field of vision, whereas generally these objects escape notice altogether.

Effective diameter of Object Glasses 50 mm.		Stereoscopic Power	14
Real Field of View	7°	Weight of Binocular	34 oz.
Linear per 1,000 yards	122	Price	**£21 10 0**
		Code Word	**"Stepnite"**

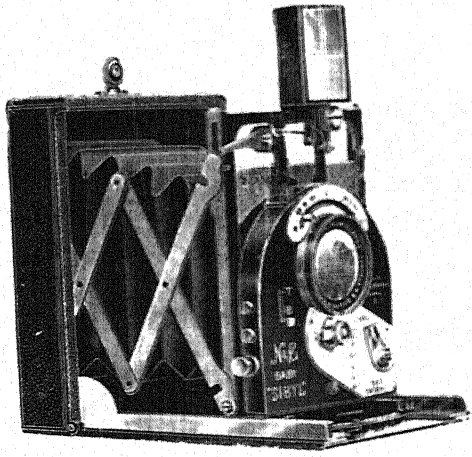
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THE FIRST AND STILL THE BEST MINIATURE CAMERA.

Full Vertical and Horizontal rise.
"N & G" Shutter, with Accurate Speeds.
½ sec. to 1/200th sec. Accurate focussing scale
Weight of plate model, 9 ozs. only.

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THE "BABY SIBYL," 4½ × 6 c.m.

The "NEW SPECIAL" and "SIBYL VITESSE" 3½ in. × 2½ in., or 6½ × 9 c.m.

THE NEW IDEAL ¼ plate.

THE "SIBYL EXCELSIOR" Roll Film. 4¼ in. × 2½ in.

All "SIBYL" Models are fitted with lenses of F4.5 aperture, except the "Vitesse," which is fitted with F3.5 lens.

They are LIGHT, COMPACT and ACCURATE, are of all metal construction, covered in the best Morocco Leather, with finest leather Bellows.

THE "N & G" HIGH PRECISION SHUTTER. An exclusive "SIBYL" feature. Every speed is guaranteed correct to within 10% of scale. The range of speeds is from ½ to 1/200th of a second on Baby "Sibyl" models; ½ to 1/150th on 3½ in. × 2½ in. models; and ½ to 1/100th on the ¼ plate models. Also time and bulb movements.

THE SHUTTER on the new **"EXCELSIOR"** and **"VITESSE"** models is of "N & G" design, embodying new principles, giving a unique range of Accurate Speeds from 2 SECONDS to 1/150th second; also positive Ball and Time movements when shutter is set at any speed.

FOCUSSING.—"N & G" patent lever focussing is fitted to all "Sibyl" models, all distances are individually scribed for each Camera, are well separated, and clearly engraved in yards.

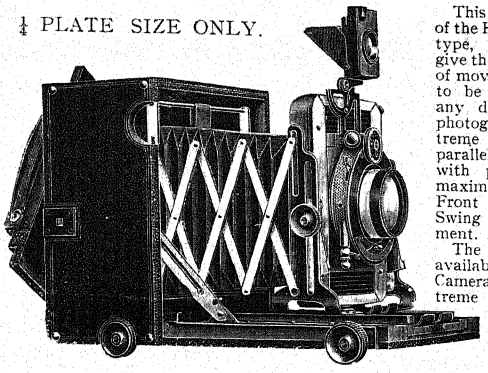
THE "N & G" PATENT FOLDING REFLECTOR FINDER is fitted to all "Sibyl" models, save only the "Baby Sibyl" plate model. This finder has a sliding lens, accurately scaled to show rising front, and is fitted with levels.

FULL RISING FRONT, both horizontal and vertical, is provided on all models.

TELE-PHOTO LENSES of the Dallmeyer "Dallon" and Ross "Teleros" type can be fitted to **all** "Sibyl" models.

"TRELLIS" CAMERA.

¼ PLATE SIZE ONLY.



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Price of "N & G" "Trellis" Camera, complete with three double dark slides, but without Lens or Shutter ¼-plate **£20 0 0**

Camera, complete with three double dark slides, fitted with "N & G" "Excelsior" Shutter and No. 7 Ross Combinable Lens—6" and 10¼" foci **47 0 0**

"N & G"

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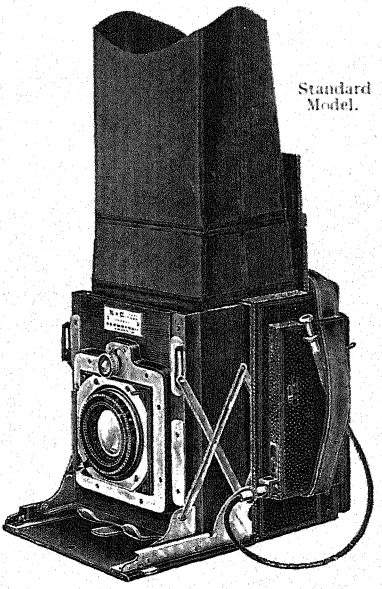
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STANDARD. F/4.5 Lenses.

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Standard Model.

The Camera is finished in the usual "N & G" style; to previous users of our apparatus no more need be said, it is simple and straightforward to manipulate and is by far the most practical and successful **Folding Reflex** on the market.

CAMERA OPEN.—Is as rigid as a **Box Form Reflex.** Focussing by means of focussing mount on each lens supplied. The camera is entirely self-contained, with no projections, a long handle being provided.

SHUTTER.—The "N & G" Self-capping, quick wind focal plane shutter is fitted. Speeds from 1/10 to 1/800th of a second, with **ball** and **time.**

THE MIRROR is very light, free from noise and vibration; all movements are of the finest steel to eliminate wear.

THE RELEASE is on left side of camera, leaving right hand free for focussing, and is delicate, yet positive. Antinous or pneumatic releases can be supplied.

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LENSES.—Only the highest grade **British Lenses** are fitted of F/4.5 aperture, and $5\frac{1}{2}$ in. focal length in the Standard Model, and F/2.9 and F/3.5 of approx. $5\frac{3}{4}$ in., in the Special Model. These are quickly interchangeable with large aperture fixed focus telephoto lenses, of the Ross F/5.5 "Teleros" and Dallmeyer F/5.6 "Dallon" type, by means of the **"N & G" quick change lens flange.**

MAGNIFIER LENSES in hood, folding inside. A Tripod Bush is provided. The Standard Model weighs only **3 lbs. 8 ozs.,** complete with F/4.5 lens. Duralumin body-work, and in other parts where possible, the Camera is **absolutely climate proof.**

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Camera complete with 3 " N & G " Double Metal Book Form Dark Slides, Dark Slide Adapter, and Hooded Focussing Screen.

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Fitted with Dallmeyer F/4.5 Serrac Lens, 5¼ in.	47 0 0
Dallmeyer F/5.6 Dallon Telephoto Lens, 10 in. focus	15 10 0
Ross F/5.5 Teleros Lens, 11 in. focus	18 5 0
SPECIAL MODEL.	
Fitted with Ross F/2.9 Xpres Lens, 5¾ in.	57 0 0
Fitted with Dallmeyer F/2.9 Pentac Lens, 5¾ in.	56 0 0
Fitted with Ross F/3.5 Xpres Lens, 5¾ in.	53 0 0
Fitted with Dallmeyer F/3.5 Dalmac Lens, 6 in.	51 0 0
Ross F/5.5 Teleros Lens, 11 in. focus	18 10 0
Dallmeyer F/5.6 Dallon Telephoto Lens, 10 in. focus	15 15 0

"SIBYL" CAMERAS.

PLATE MODELS, complete with 3 "N & G" Metal Double Dark Slides and Focussing Screen.

Lens.	Baby 4½×6 c/m	New Special 3½×2½ or 6½×9 c/m.	New Ideal ¼-plate or 4¼×3¼
Ross F4.5 Xpres	£19 5 0	£23 0 0	Double Dark Slides cannot be supplied.
T.T. and H.F4.5 Sibyl Aviar	19 5 0	—	
Dallmeyer F4.5 Serrac ...	18 10 0	22 5 0	
Wray F4.5 Lustrar ...	17 10 0	21 5 0	

The New "Sibyl Vitesse." 3½×2½ in. or 6½×9 c/m.

Ross F/3.5 Xpres Lens	£30 0 0
Dallmeyer F/3.5 Dalmac Lens ...	28 0 0

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Ross F4.5 Xpres	Single Dark Slides cannot be supplied	£21 10 0	£25 0 0
T.T.and H.F4.5 Sibyl Aviar		—	25 0 0
Dallmeyer F4.5 Serrac ...		20 10 0	24 5 0
Wray F4.5 Lustrar ...		19 10 0	23 5 0

ROLL FILM MODELS.

The New "Sibyl Excelsior." 4¼×2½

Ross F4.5 Xpres	29 10 0
T.T. and H.F4.5 Sibyl Aviar ...	29 10 0
Dallmeyer F4.5 Serrac	28 15 0

Lens.	Baby 4½×6 c/m	New Special 3½×2½ or 6½×9c/m	New Ideal ¼-plate or 4¼×3¼
Ross F4.5 Xpres	£19 15 0	£23 0 0	£26 0 0
T.T. and H.F4.5 Sibyl Aviar	19 15 0	—	26 0 0
Dallmeyer F4.5 Serrac ...	19 0 0	22 5 0	25 5 0
Wray F4.5 Lustrar	18 0 0	21 5 0	24 5 0

TELE-PHOTO LENSES for use with "Sibyl" Cameras.

Dallmeyer F6.5 Dallon ...	(5½ in.) £5 10 0	(9 in.) £8 12 6	(10½in.) £10 10 0
Ross F5.5 Teleros	(6½ in.) 10 10 0	(9 in.) 12 5 0	(11 in.) 14 15 0

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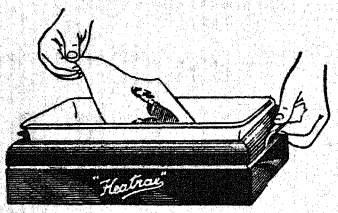
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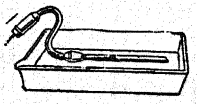
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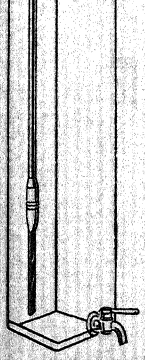
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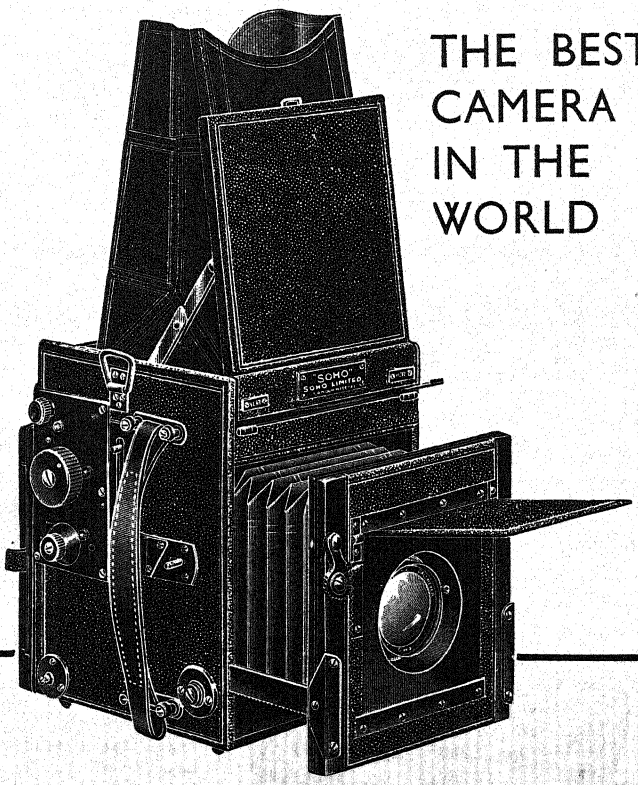


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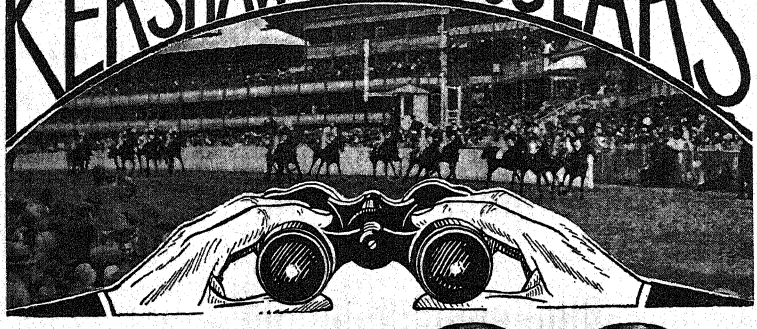


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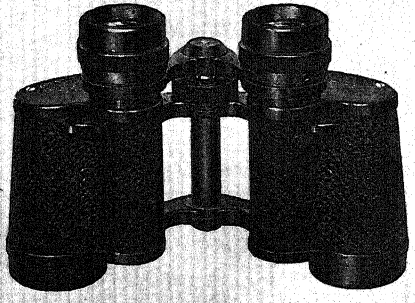
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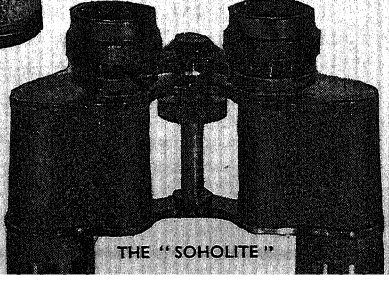
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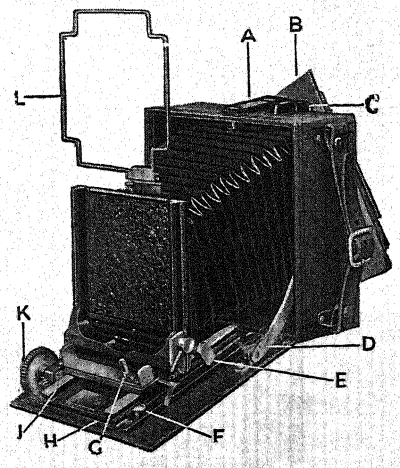
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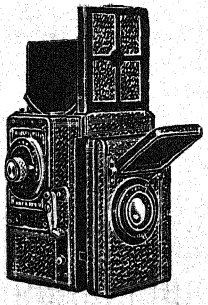
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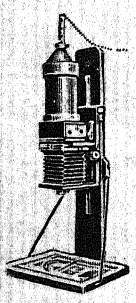
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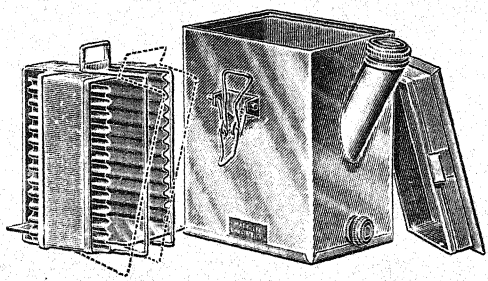
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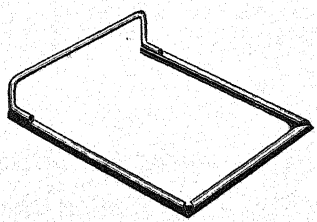


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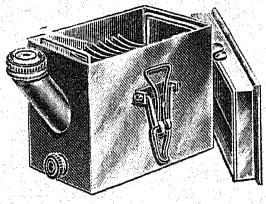
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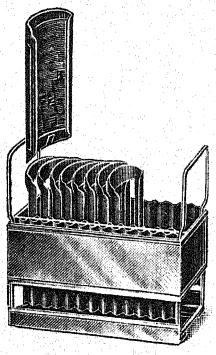


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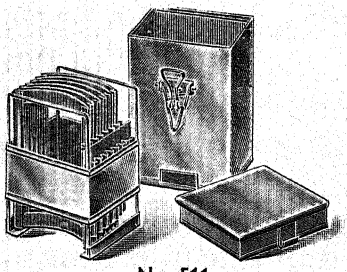
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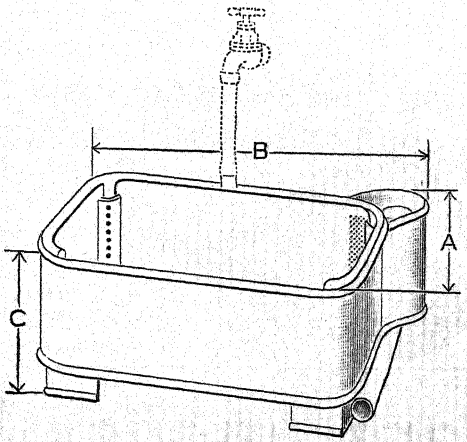
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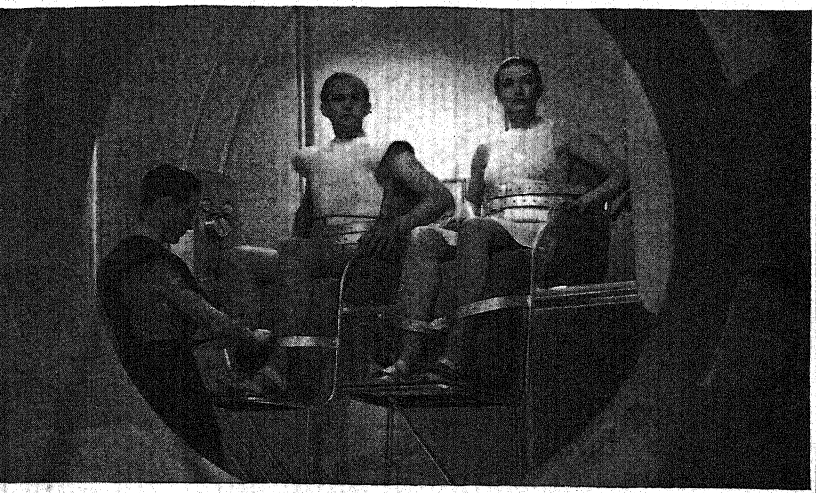
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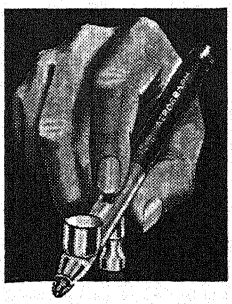
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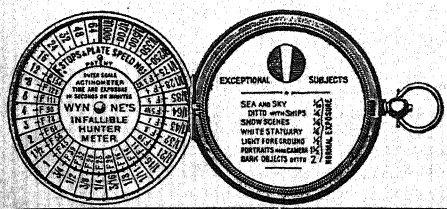
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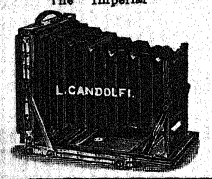
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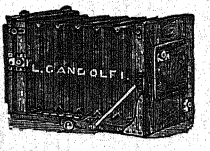
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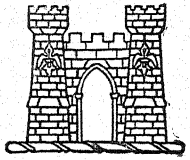
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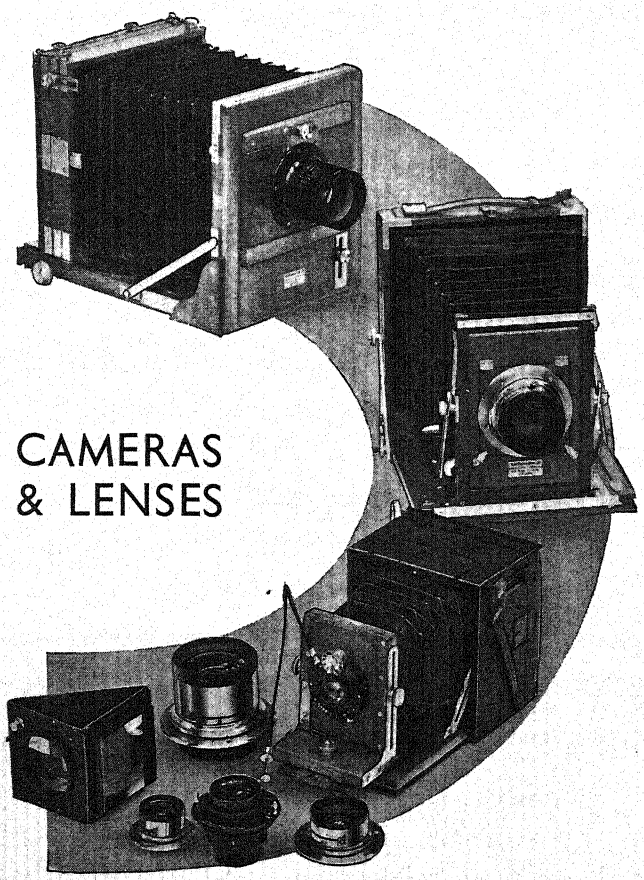
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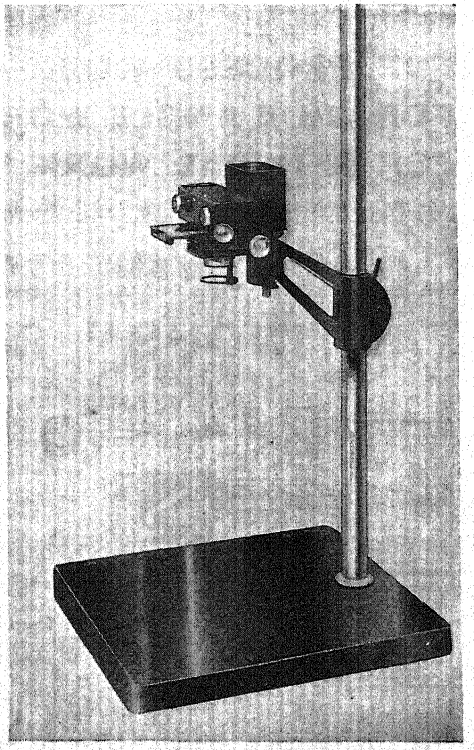
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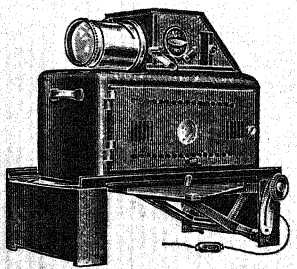
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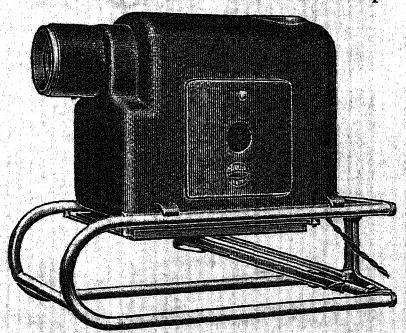
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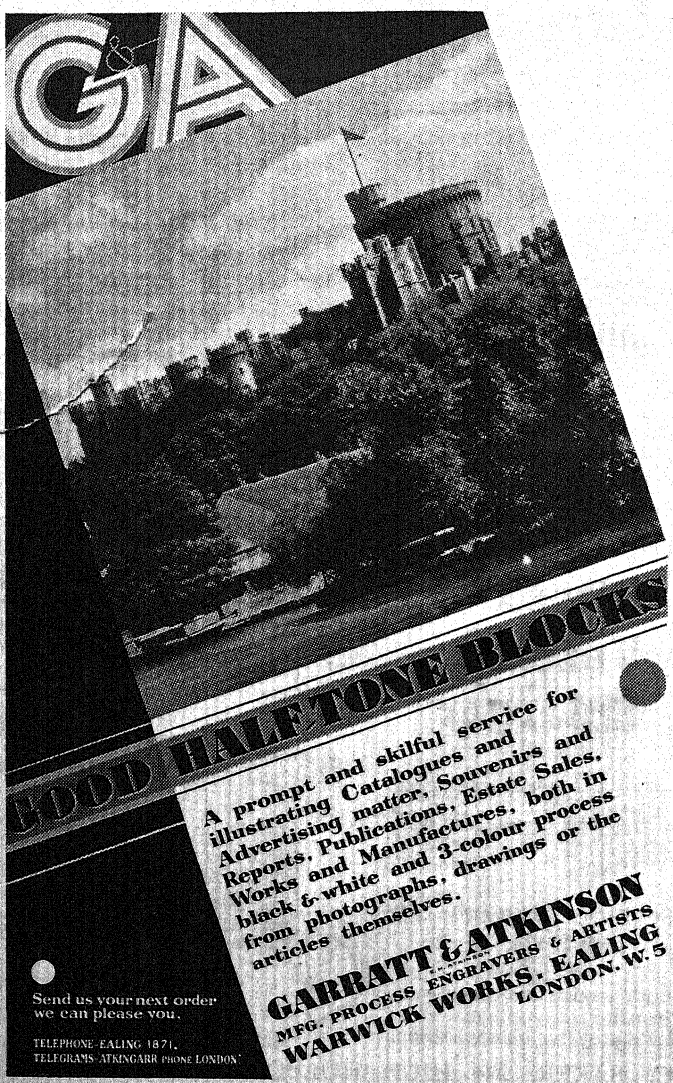
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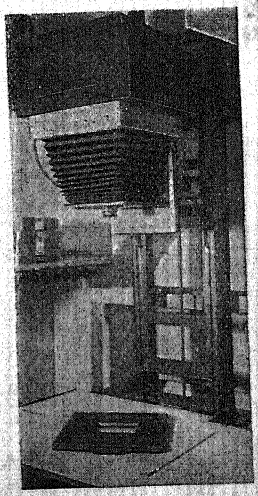
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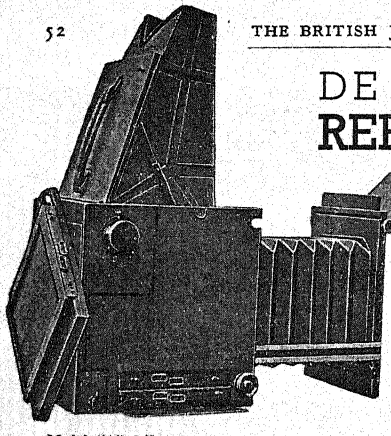
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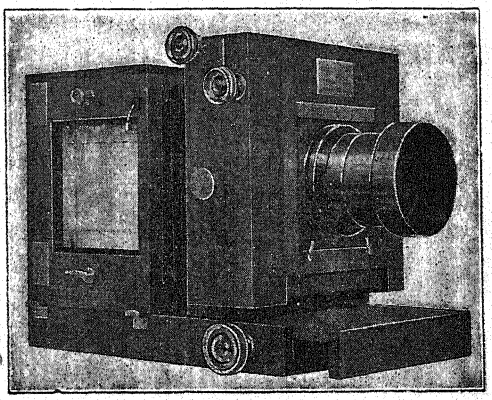
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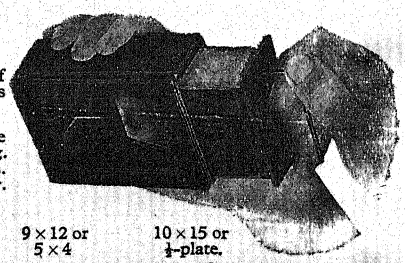
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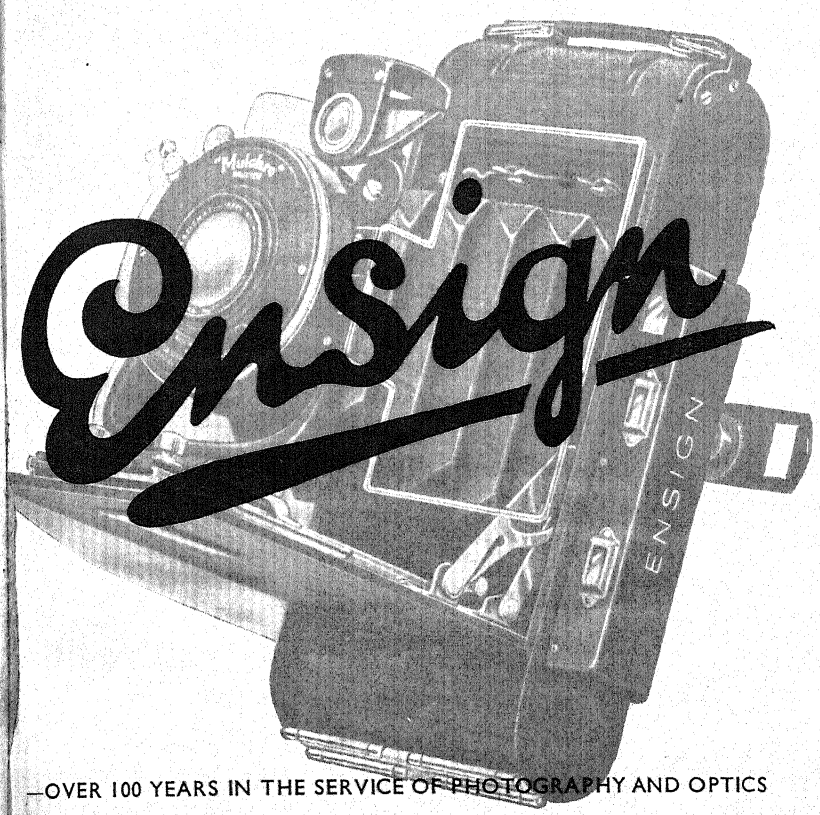
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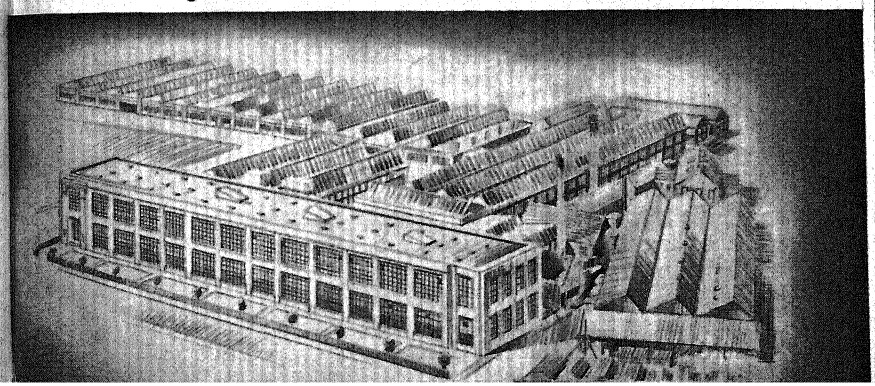
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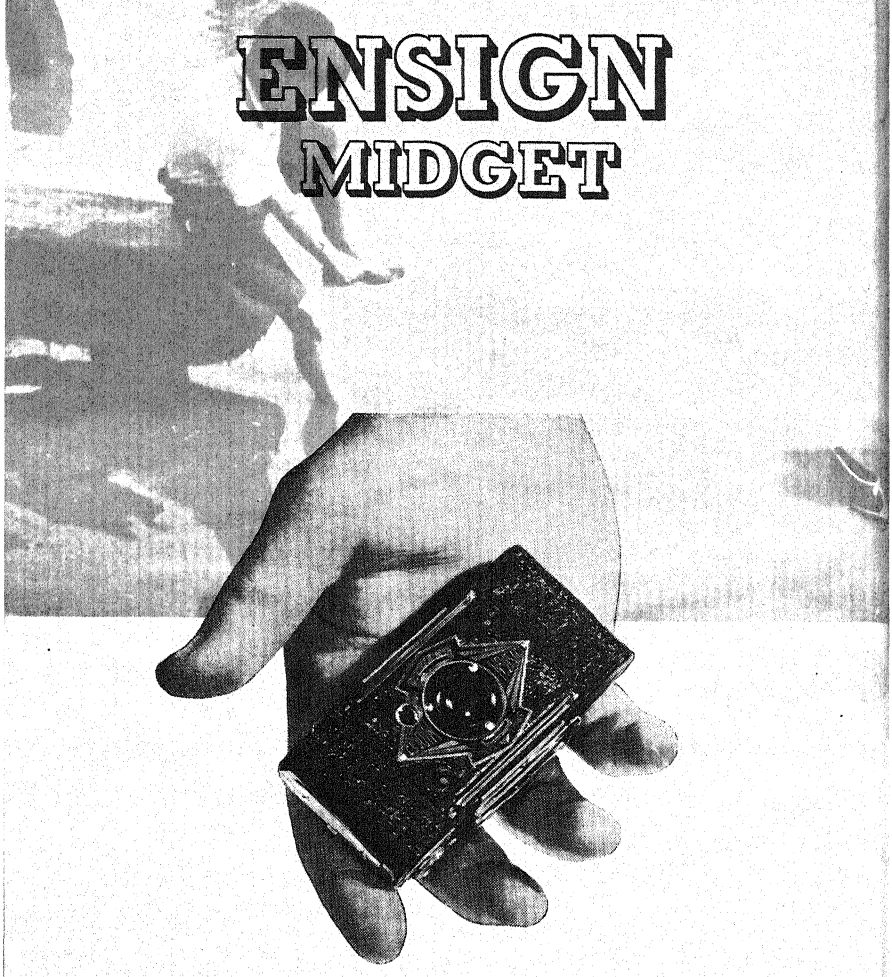


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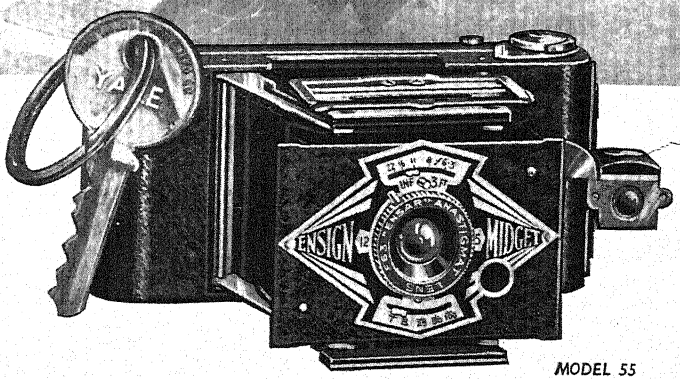


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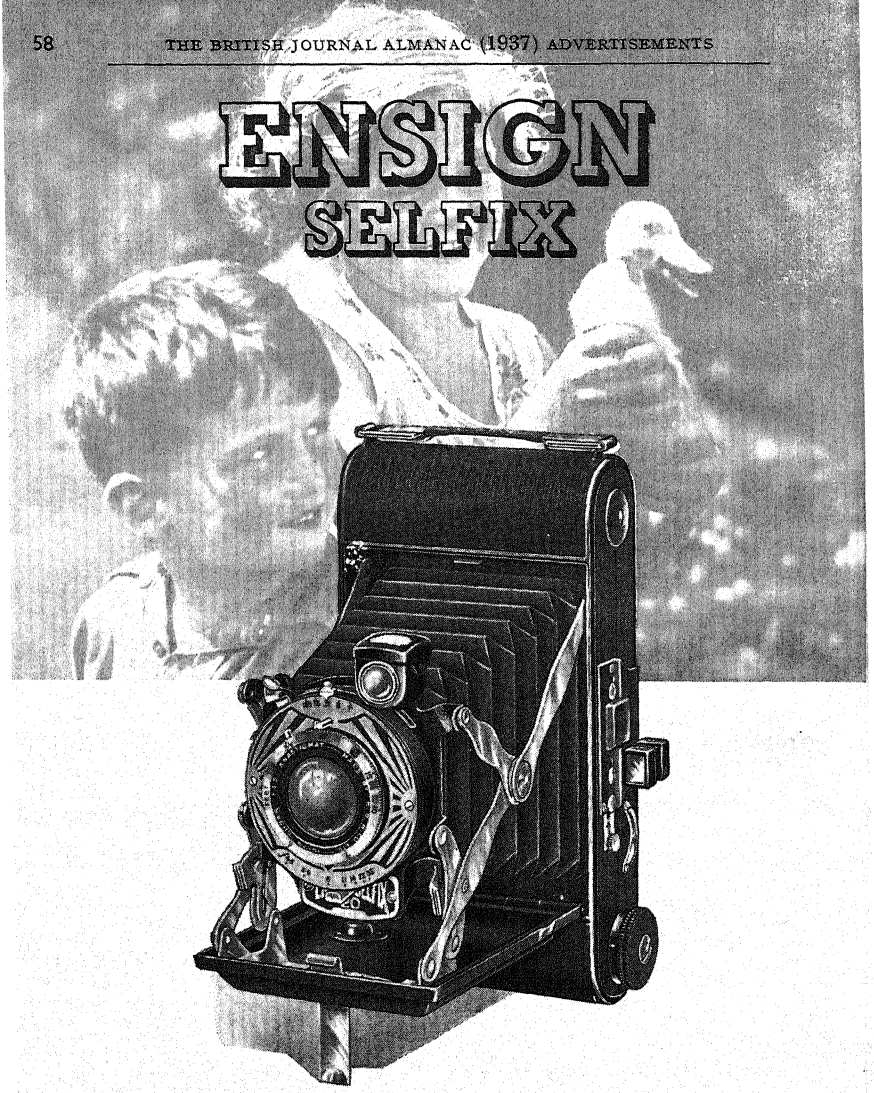


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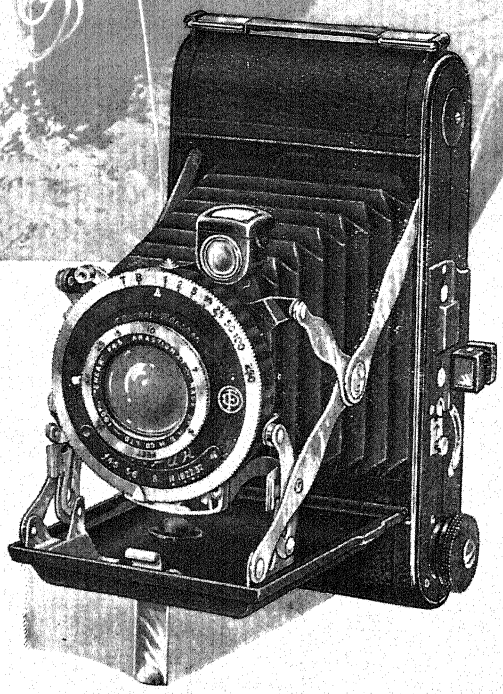
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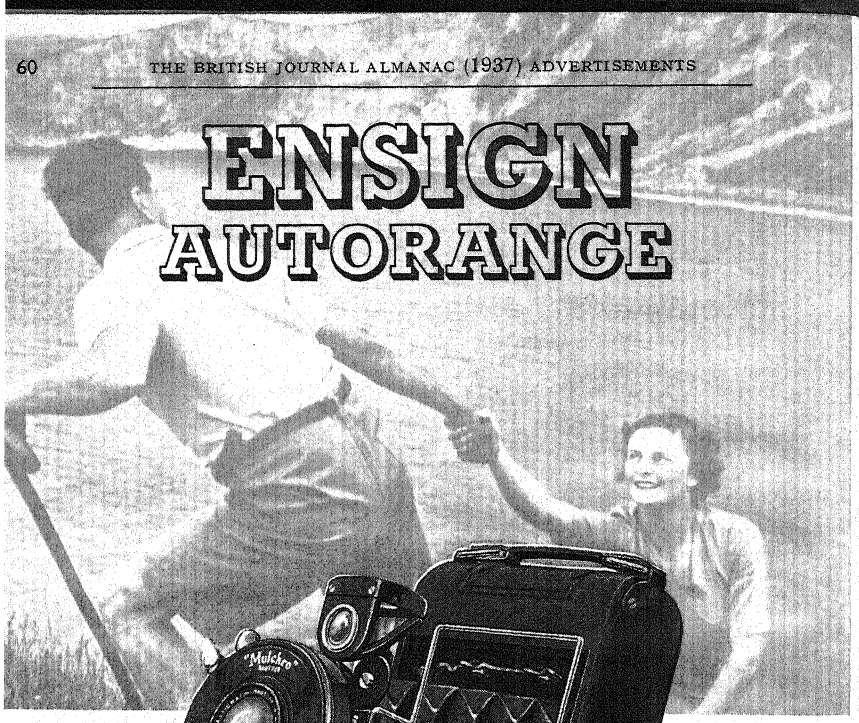
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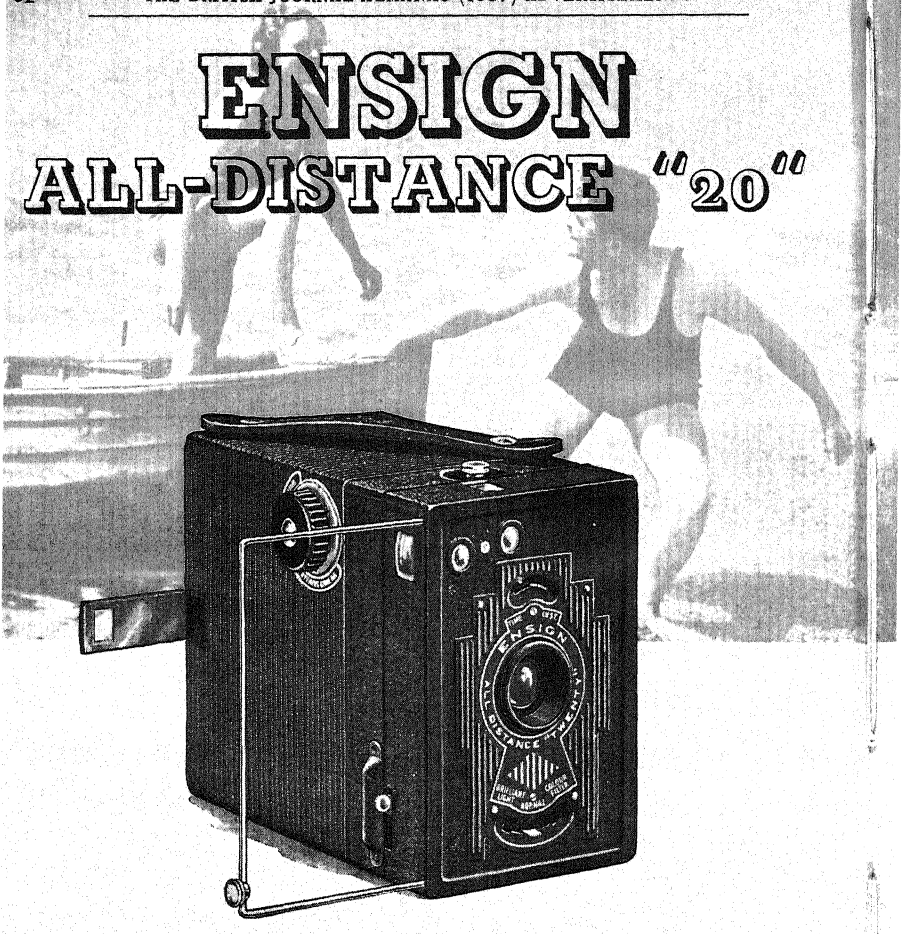
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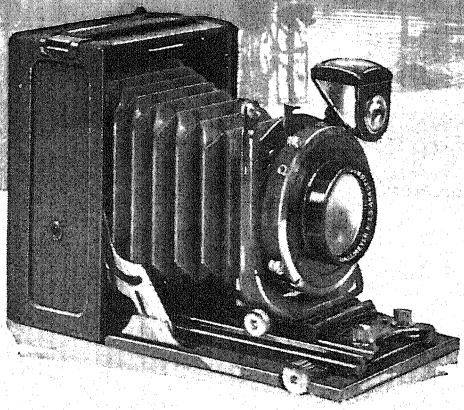


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Beautiful pictures can be secured with this remarkable box camera, for it has a built-in colour filter which ensures a correct rendering of tone values. The patent ENSIGN All-Distance lens gives pin-point definition at all distances from 3 feet upwards. Neat, compact, strongly made and simple to use, it is the finest box camera there is.

15/-

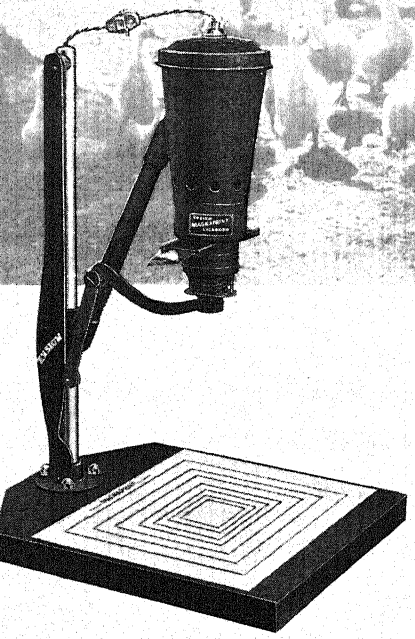
ENSIGN SUPER-SPEED CAMEO



A most adaptable camera which can be used with film-packs, plates, cut film or roll films (in roll film holder). Very sturdily built. Rising and cross front movements. Long double extension, rack and pinion focussing. Optical direct vision finder. Capable of tackling any subject. Black and chromium or brown and florentine finish. Picture size $3\frac{1}{2} \times 2\frac{1}{2}$ inches.

Dallmeyer F/3.5 anastigmat in Compur shutter (speeded to 1/200 sec.) **£13 15 0**

ENSIGN MAGNAPRINT ENLARGERS



Automatic Focussing Model.

AV/0 For all miniature negatives, with DALLMEYER F/4.5 anastigmat. Enlarges to 15 × 12 ins. .. **£8 15 0**

ENSIGN MAGNAPRINT Enlargers give super-speed without loss of quality, due to the perfect system of illumination, whereby the light, diffused at its source and requiring no adjustment, is concentrated on the lens by a powerful double condenser.

By this means, every ray of light coming from the illuminating source is used for the purpose of exposure.

Grain, scratches and imperfections in the negative are reduced to a minimum and at the same time excessive contrast is controlled.

"MINIATURE" MAGNAPRINTS

Standard Models.

V/0 For all miniature negatives, with ENSAR F/6.3 Enlarging anastigmat. Enlarges to 15 × 10 ins... **£4 15 0**

V/0M As above but with MAGNAR F/4.5 Enlarging anastigmat **6 10 0**

V/0L As Model V/0 but without lens, and with front adapted to take interchangeable Leica lenses .. **4 10 0**

MODELS WITH FRICTION DRIVE RAISING MECHANISM

For all sizes up to 2¼ × 2¼ (6 × 6 cm.). Enlarges 2¼ × 2¼ up to 15 × 15, other sizes in proportion.

V/10 With ENSAR F/6.3 Enlarging anastigmat .. **£7 15 0**

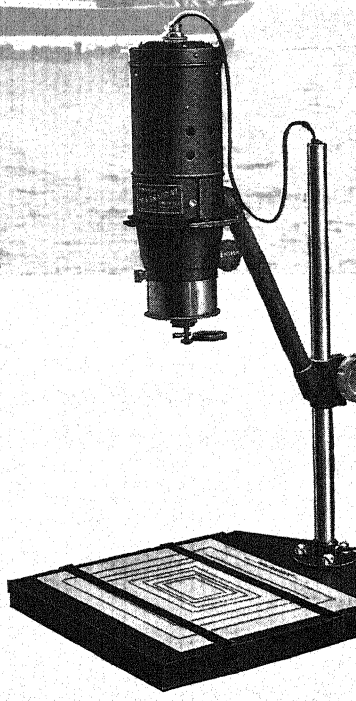
V/10M With MAGNAR F/4.5 Enlarging anastigmat.. **9 10 0**

For all sizes up to 2¼ × 3¼ (6 × 9 cm.). Enlarges 2¼ × 3¼ negatives from P.C. up to 15 × 12. Smaller size negatives in proportion.

V/11 With ENSAR F/6.3 Enlarging anastigmat .. **£8 10 0**

V/11M With MAGNAR F/4.5 Enlarging anastigmat.. **10 0 0**

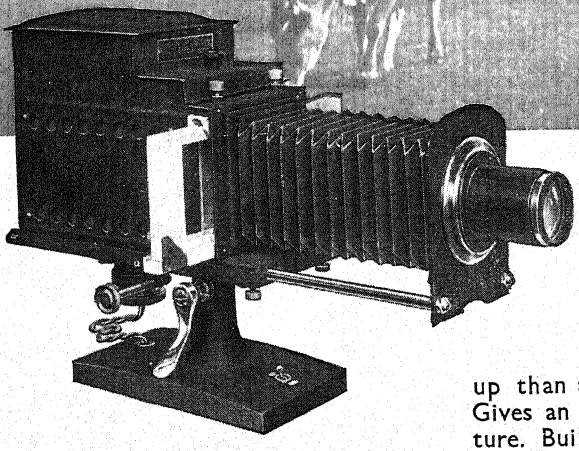
ENSIGN MAGNAPRINT ENLARGERS



Automatic Focussing Model for 2¼ × 3¼ With Friction Drive Raising Mechanism

AV/11 For negatives up to 2¼ × 3¼. With Dallmeyer F/4.5 Enlarging anastigmat. Enlarges up to 15 × 12 ins. .. **£12 0 0**

ENSIGN
OPTISCOPES



The most modern of projection lanterns. Needs no more fitting up than an ordinary table lamp. Gives an amazingly brilliant picture. Built to a design based on many years of experience, and supremely practical. The Model 6A (illustrated) is equally suitable for black-and-white or coloured (Dufaycolor) pictures mounted as slides. For use at home or in small halls. Takes 250 or 500 watt lamps. In handsome fibre carrying-case, and including slide carrier and all necessary leads and plugs (without lamp).

With ALDIS UNO Projection Lens, 8 or 10 in. focus **£8 10 0**

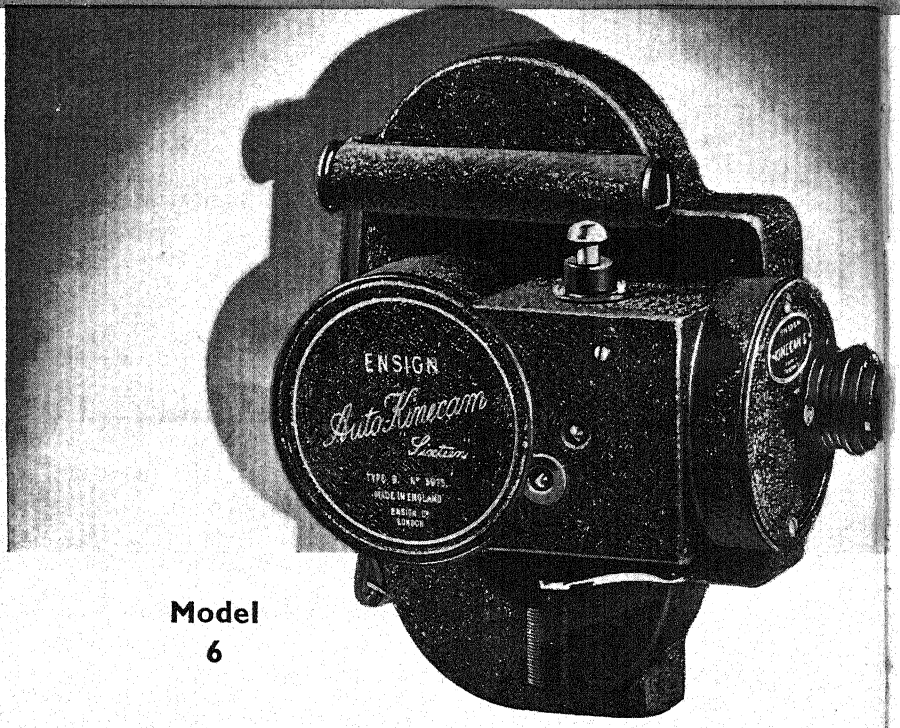


The "Good Tempered" Films—for Best Results

Ensign Films are made specially for amateur photography. That is to say, they are made to get first-class results without the aid of special lighting and make-up effects that professionals use. There are sizes to fit every camera, and two grades are available—ENSIGN, with a "standard" emulsion; and ENSIGN ULTRA-CHROME, a chrome film of the highest merit.

ENSIGN KINECAM

16mm. CINE CAMERA



Model 6

Good Cine pictures, steady on the screen and completely free from eye-straining flicker, are only possible with really well-made precision Cameras.
Ensign Kinecams are precision Cameras throughout, and are made and designed by engineers who have a whole life of experience in the design and manufacture of this type of apparatus. Only the best engineering methods of manufacture are employed, with the result that the mechanism of an Ensign Kinecam works so smoothly as to be hardly audible, never wears out, and is a constant pleasure to use, giving a maximum of perfect results with a minimum of trouble. Complete with hand-sewn leather cases, velvet lined (except Model 6 F/3.5 which has hand-sewn, unlined, leather case).

MODEL 6	
Dallmeyer F/3.5, 1-in. focus	£13 13 0
MODEL 6 with direct vision axial finder	
Taylor-Hobson Cinar F/2.8, 1-in.	18 18 0
Dallmeyer Speed Cinar F/1.5, 1-in.	25 0 0
MODEL 8 with direct vision axial finder	
Taylor-Hobson Cinar F/2.8, 1-in.	45 0 0
Dallmeyer Speed Cinar F/1.5, 1-in.	50 0 0

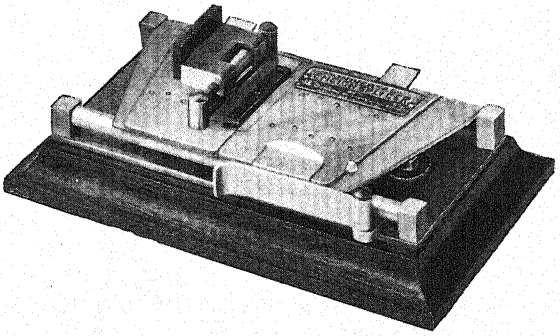
ENSIGN CINE ACCESSORIES

FOR 16 mm.—9.5 mm.—8 mm. FILM

"UNIVERSAL" FILM SPLICER

For 16 mm. silent and sound film, 9.5 mm. and 8 mm. films.

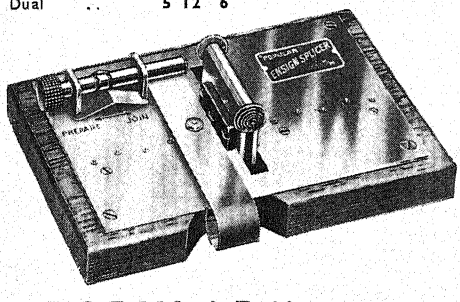
Fitted with an automatic dry scraper so constructed to prevent the excessive scraping of the base. The trimming of the ends and actual joining are carried out in one movement. The Splicer is held in position with special plugs which allow for fixing to the Editor Board. Complete with 1 oz. bottle Ensign "Universal" Film Cement **57/6**



"UNIVERSAL" FILM EDITOR

incorporating above Splicer.

Single .. **£5 7 6**
Dual .. **5 12 6**



"POPULAR" FILM SPLICER

Three models for 16 mm., 9.5 mm. and 8 mm. films.

Fitted with an accurately ground and hardened steel scraper, film shearing lever and an efficient pressure pad, makes joining a quick and simple operation. Two holes are provided in the base for immediate and easy fitting to the "Popular" Editor. Complete with 1 oz. bottle of Ensign "Universal" Film Cement.

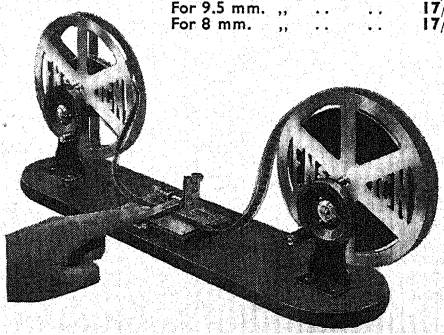
For 16 mm. films **17/6**
For 9.5 mm. ,, ... **17/6**
For 8 mm. ,, ... **17/6**

"POPULAR" FILM EDITOR

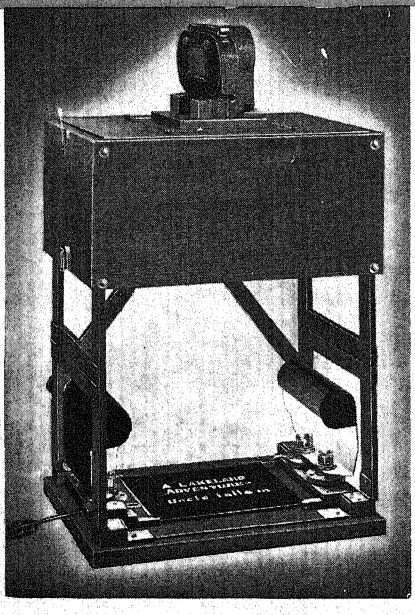
Three models for 16 mm., 9.5 mm. and 8 mm. films. Two arms each consisting of a hand crank, geared 3—1 and fitted with a 20 in. long by 5 in. wide polished stained base. Complete with Ensign "Popular" Film Splicer, and 1 oz. bottle of Ensign "Universal" Film Cement.

For 16 mm. reels **42/6**
For 9.5 mm. ,, ... **42/6**
For 8 mm. ,, ... **42/6**

Any of the above Models can be supplied without Splicer .. **25/-**



ENSIGN ANIMATOR & TITLER



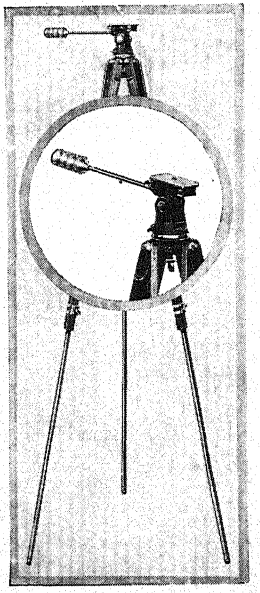
Ideal for making every kind of title. Cartoons and animated work of every kind can be carried out. Erected in a moment. Title background 10 × 7½ in. Complete set of white felt letters, CAPITALS and LOWER CASE. Reversible black/white flock lined title background. Background cover glass, tweezers and set square.

For natural colour films a variety of coloured felt letter founts and title backgrounds are available.

Suitable for most types of sub-standard cine cameras. A special 2 ft. supplementary lens is available for cameras having a fixed focus lens. The accessories are all contained in a separate box attached to the Animator.

£6 17 6 (less lamps)

CINE-PAN TRIPOD



FEATURES:

The top plate is hinged and the camera can be fixed at right angles for floor "shots."

The camera is fixed by a screw hidden in the head when closed.

Panorams a complete circle, and elevates to 150 degrees.

Top leg sections, fashioned oak, lower sections of steel tube, chromium-plated.

Height fully extended, approximately 6 ft., closed 2 ft. 9 in.

One of the steel legs accommodates a wire bracing arrangement.

The large lever grip holds adjusting spanners.

The lever control is permanently attached by a knuckle joint, and folds down when the tripod is closed.

One end of each leg is provided with a spike for use on rough ground. The other end of each leg has a rubber buffer for use on slippery floors.

£7 10 0

BARNET

PLATES, PAPERS & FILMS

Barnet Plates

For Studio, Commercial, Industrial, Amateur and Technical Photography

	H. & D. Speed
ULTRA-SENSITIVE PANCHROMATIC	2500
SUPER-PRESS	1500
SUPER-ISO	1400
SOFT-PANCHROMATIC	700
*XL SUPER-SPEED ORTHO ...	700
STUDIO	500
*SUPER-SPEED ORTHO	550
STUDIO-ORTHO	400
*SPECIAL RAPID PANCHROMATIC	400
*SELF-SCREEN ORTHO	300
SPECIAL RAPID	275
*ORDINARY	100

LANTERN. Cold Tone.
LANTERN. Cold or Warm Tone.
C.G. LANTERN. Gaslight for Contact.
VERONA LANTERN. Warm Tone.

Barnet Plates

For the Process and Allied Trades

ULTRA-SENSITIVE PANCHROMATIC	2500
SOFT-PANCHROMATIC	700
*SPECIAL RAPID PANCHROMATIC	400
RAPID PANCHROMATIC PROCESS	100
RAPID PANCHROMATIC PROCESS EXTRA GREEN SENSITIVE ...	100
LINE-TONE PANCHROMATIC PROCESS (THIN FILM)	25
LINE-TONE PROCESS (THIN FILM)	10
PROCESS	75
PROCESS-ORTHO	50
*ORDINARY	100
*†FINE GRAIN ORDINARY	50
†PROCESS (SPECIAL SERIES) ...	15

† Can be supplied as Dry Stripping Plates.

Barnet Plates

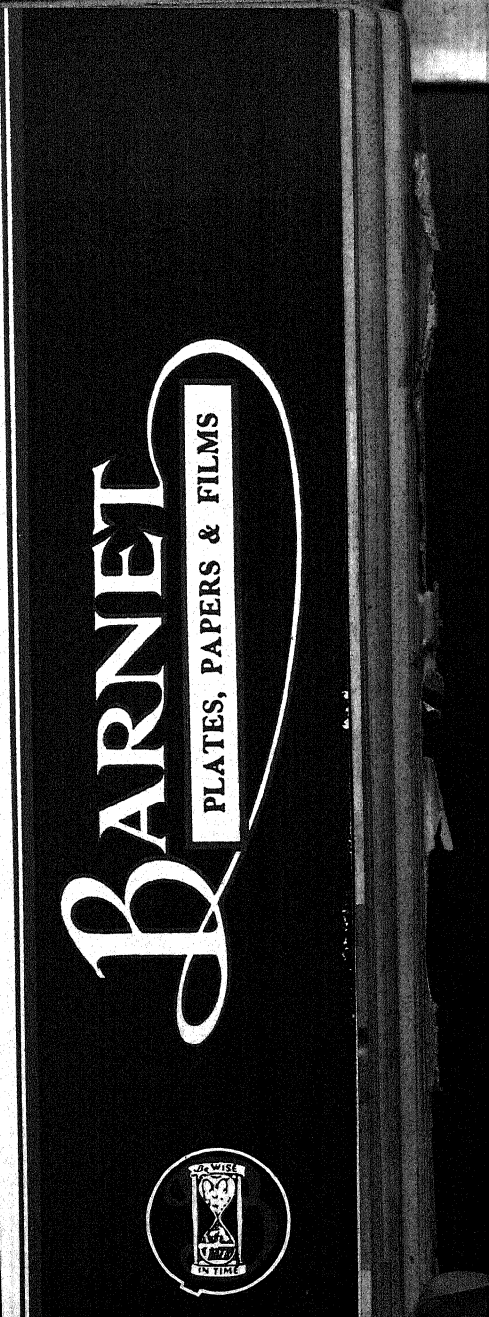
For Press Photography

SUPER-PANCHROMATIC PRESS ...	2500
SUPER-FIXER PRESS	1500
SUPER-PRESS	1500
PRESS-ORTHO	700

* Also supplied in Barnet Matt Emulsion.

Prices on Application

ELLIOTT & SONS LTD



BARNET
PLATES, PAPERS & FILMS

Barnet Bromide Papers

Standard Grades for General Use

SUPER-PRESS		Surface
Single and Double Weight	...	Glossy.
Super Extra Vigorous	...	
Extra Vigorous, Vigorous	...	
Normal and Soft	...	
MATT		
Single Weight	...	Matt.
Vigorous and Normal	...	
Double Weight	...	
Vigorous, Normal and Soft	...	
SEMI-MATT		
Single Weight	...	Semi Matt.
Vigorous and Normal	...	
Double Weight	...	
Vigorous, Normal and Soft	...	
ILLUSTRO		
Single and Double Weight	...	Glossy.
Super Extra Contrasty, Extra Contrasty, Contrasty, Normal and Soft	...	
CREAM CRAYON		
Double Weight *Vigorous and Normal*		Platino-Matt Smooth. Natural Surface Smooth. Semi-Matt.
Double Weight *Normal*	...	Platino-Matt Rough. Natural Surface Rough.
PLATINO-MATT		
Single and Double Weight *Normal*	...	Rough.
Single and Double Weight *Normal and Vigorous*	...	Smooth
ORDINARY		
Single and Double Weight *Normal*	...	Rough and Smooth.
Single and Double Weight *Vigorous*	...	Smooth.
TIGER TONGUE		
Double Weight *Normal*		Cream Extra Rough

Prices on Application.

ELLIOTT & SONS LTD

BARNET
PLATES, PAPERS & FILMS
WISE IN TIME

BARNET

PLATES, PAPERS & FILMS

Barnet Bromide Papers

(Continued)

REGAL ROUGH Surface.
Double Weight *Normal* White and Cream.

MEDIUM ROUGH
Double Weight ... ... } Cream and
Vigorous and Normal ... ... } Ivory White.

VELVET
Single Weight ... ... } Pebble Grain
Vigorous, Normal and Soft ... }

LINEN GRAIN
Double Weight *Normal* White and Cream.

POST CARDS in all Grades.

Barnet Chloro-Bromide Papers

VERONA DE-LUXE

For Contact Prints and Enlargements.

Yields a very rich warm brown-black colour by direct development. Also, if required, a wide range of pleasing warm tones can be obtained.

Grades (all Double Weight)—

Cream Matt.	Cream Silk-Lustre.
Cream Smooth Natural.	White Silk Lustre.
Cream Rough Natural.	White Matt.

VERONA

A warm-tone paper of superb quality. Grades as follows:—

"**Standard**" for Contact Prints—

Cream Smooth Natural.	Cream Matt.
Cream Semi-Matt.	White Matt.

"**Rapid**" for Enlargements—

Cream Smooth Natural.	Cream Matt.
Cream Rough Natural.	White Matt.

All Double Weight.

Barnet Negative Cards

Supplied in two Grades:—

"**NORMAL**" ... Suitable for out-door photography.

"**RAPID**" ... For Studio work.

Prices on Application.

ELLIOTT & SONS LTD



BARNET

PLATES, PAPERS & FILMS

Bar-Gas

(Barnet Gaslight Paper)

A Gaslight Paper of great charm, clean working and reliable. Made in a variety of grades to suit negatives of any character, whether thin or hard in quality.

An ideal paper for Snapshot prints and highly recommended for

D. & P. WORK.

Supplied in the following Surfaces and Grades:—

GLOSSY... ... In Vigorous, Medium, Soft and Extra Soft.

VELVET (ART) In Vigorous, Medium and Soft.

MATT ... ... In Vigorous and Soft.

Barnet Line-Tone Negative Paper

For photomechanical work.

Barnet Document Paper

For copying and recording work (Three Grades).

Barnet Films

SUPER-SPEED PORTRAIT FILM ...	700
ORDINARY FILM	100
PROCESS FILM	15
FINE GRAIN ORDINARY FILM	
LINE FILM	
ROLL FILM (SELF-SCREEN).	
SENSICHROME ROLL FILM.	

Prices on Application.

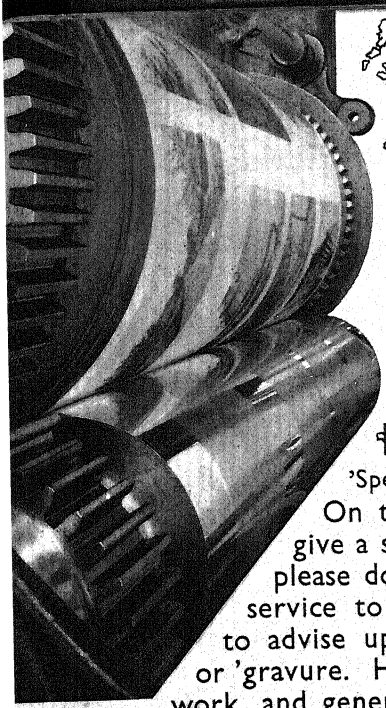
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BARNET PLATES, PAPERS & FILMS

ALWAYS IN TIME



HOOD
of MIDDLESBROUGH

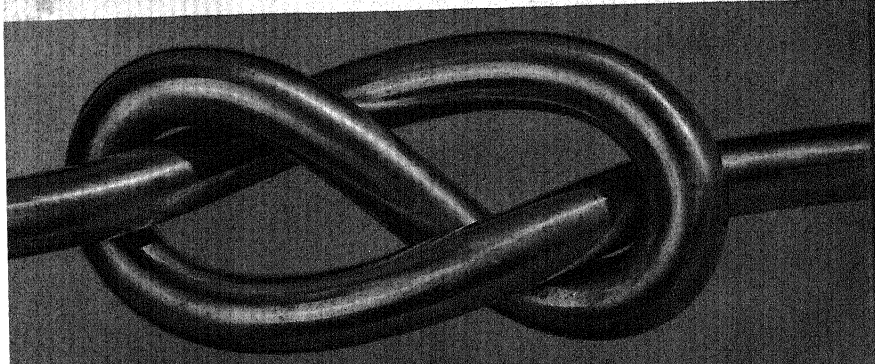
FOR YOUR

BLOCKS, PRINTING, PHOTOGRAVURE

'Specially PICTURES for every purpose.

On these next three pages Hoods give a summary of their services ; but please do write to see if we can be of service to you ; we are highly qualified to advise upon any form of fine printing or 'gravure. Hoods welcome difficult unusual work, and generally manage to please some of the most shrewd buyers of engraving and printing, as to quality, price and time. Colonial and Foreign Clients : The Air Mail now gives us great help in handling your instructions quickly. (Hoods correspond in several languages).

A KNOTTY PROBLEM—A Steel Bar 1″ thick, tied cold.
Photo by Hoods for advertisement of steel firm.

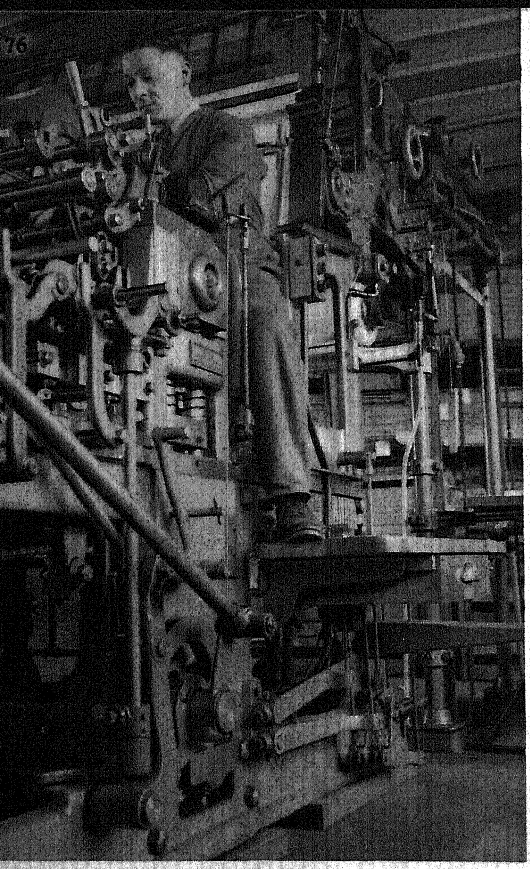


HOODS SANBRIDE MIDDLESBROUGH

HOOD
ENGRAVING

Finest Tone Blocks and Line Blocks. Delivered on time. True products of finest British materials and British skill. COST.—Trade orders are especially encouraged by generous Trade Discounts to Professional Photographers, Printers and Publishers only, making block-handling worth while. Hood Blocks are produced at a speed which astounds new customers. (Old customers take that for granted.)

Hoods make a special feature of Colour Blocks from photographers' own 3-colour negative sets. These negatives are quite simple to obtain, and facilitate the production of Colour Blocks of non-portable subjects.



"MAKE-READY"—Recently installed at Hoods' works is this 25ft.-long printing press, here shown in preparation for a run. This machine and many others are at your command! Here at Sanbride Works Hoods have, under one roof, all the makings of perfect and speedy printing; including layout artists with the ideas, for things like this striking catalogue cover ⟶ Hoods excel in exquisite illustrated work.

"*This magnificent volume...*"—The "Times" thus describes our recent great book "Java, Sumatra and Bali". (For Mr. K. Satake)

Hoods also do the other dry but necessary work such as blotters, envelopes, business stationery, showcards (we shape-cut to any shape), text books, books of figures and fractions (we





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COLOUR BLOCKS, 2, 3 or 4 colour, from Paintings, Objects, Dufaycolors, or from uncoloured or Colour Photographs.

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LINE BLOCKS from line drawings, for Advertisements, Diagrams, Maps, etc. (The specimen on the right, is from Scraper-Board drawing). Two or more colours if required, and with Shading Mediums.

AUTOBLOCKS (Regd.)—Tone Blocks, mass produced, at a price which enables even cheap printing to be illustrated adequately. Write for full details.

DESIGNS. Retouching, Lettering, Artists' work, Type-setting,—excellent work at very low prices.

PHOTOGRAPHY. A well equipped commercial studio for expert photography of anything portable, especially for producing Colour Blocks.

NAME & DOOR PLATES. In every suitable material and every finish; from the smallest inscription plate to the heaviest enamelled Bronze for Bank Offices and the like.

HOODS ENGRAVERS AND PRINTERS
SANBRIDE WORKS

STANDARD TONE BLOCKS for general purposes where the finest workmanship is necessary. If you do not already use Hood Blocks, you should send your next order here to Middlesbrough. YOU will be glad of this recommendation!

CARRIGAN





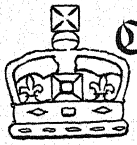
BY COURTESY KINGSWAY STUDIOS, STOKE-ON-TRENT

HOOD Gravure

Does this modern miracle daily: Turns a lot of good photographs of all sizes and shapes, together with bundles of typescript, into beautiful booklets or catalogues or folders, which show the goods to the customer nearly as effectively as would an expert salesman in person. This year, with the aid of a Hood Gravure catalogue, one of our customers lifted an order worth over £1,500,000. Really good illustrated advertising is now more than ever essential in modern commerce.

HOODS

SANBRIDE WORKS
MIDDLESBROUGH



Coronation Printing

Hoods will be pleased to quote for your local Souvenir or other special printing in connection with this great occasion.

READ THESE PLEASE while we look the other way :

From a Government Official :
"Your attention and courtesy throughout the negotiations have been much appreciated"

From a Photographer :
"I am more than satisfied and my clients are delighted to such measure that they have placed all their publicity with me."

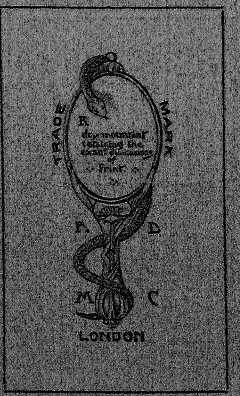
Poultry Appliance Manufacturers :
"We are very pleased with the catalogues; they have turned out excellently."

Lady Rutherford :
". . like you to know how delighted I am with the Photogravure Christmas Cards and Calendars . ."

POSTCARDS in bulk, from your prints or negs. Use Hood Block-printed cards for speed and quality: Hood Gravure cards for superlative beauty. A Price List of either or both of these awaits you. Most of our postcard customers order again and again! You may get cheaper, but where can you get such lovely cards? You must see these yourself,—a few we send free, or large batch 6d. please.

The Adhesive Dry Mounting Co., Ltd.

"ADEMCO" ADHESIVE DRY MOUNTING TISSUE



See that every packet bears this trade mark and green label

Special packing for Tropical Countries

Accept no substitute. Write for complete Catalogue.

"ADHERO" CAMBRIC AND MATT BORDER TINTS.

These papers are coated on the back with our Dry Adhesive, so that it is only necessary to trim to the desired dimensions. They make a very unique and effective finish to any mount.
Sample free on application.

FLEXIBLE MOUNTS

ADHERO SERIES. **ANTIQUARIAN SERIES.**

Specially adapted for Dry Mounting.
Sample Book free on application.
Customers' own prints mounted in our own showroom at reasonable prices, or special quotations given for quantities.

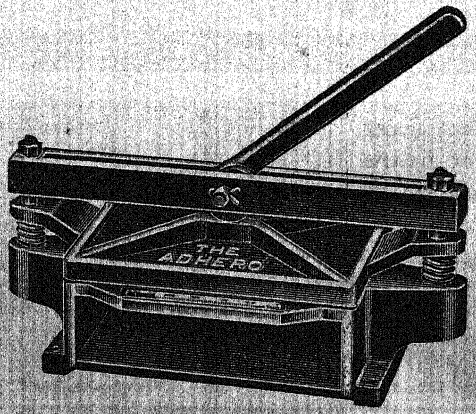
27 & 28, Fetter Lane, London, E.C.4.

The Adhesive Dry Mounting Co., Ltd.

Telegrams—"Accroitre, London," Code A.B.C.

The ADHESIVE DRY MOUNTING CO., Ltd.,
27 & 28, Fetter Lane, London, E.C.4.

ORIGINATORS OF THE DRY MOUNTING PROCESS



"THE ADHERO"

The only machine for amateurs at the price giving even pressure over the whole of the surface of the print at one and the same time.

Those acquainted with the extreme value which may be attached to the Dry Mounting method candidly admit that this apparatus brings the amateur in line with the professional as regards mounting.

The Dry Mounting method is most simple and effective.

The "ADHERO" machine will mount a ¼-plate, 5 by 4, or a ½-plate print on a mount up to 10 inches wide in one pressure. Whole plate prints on 10 by 15 mounts in two pressures. Size of heated plate 7½ by 5½, width between arms 10½ inches.

PRICES.

OUTFIT No. 1, for Gas heating,	55s. 0d.	complete.	Each Outfit includes Accessories and One Packet of Adhesive Tissue, Border Tints, and Mounts.
,, ,, 2, ,, Spirit ,,	60s. 0d.	,,	
,, ,, 3, ,, Electricity,	75s. 0d.	,,	

27 & 28, Fetter Lane, London, E.C.4.

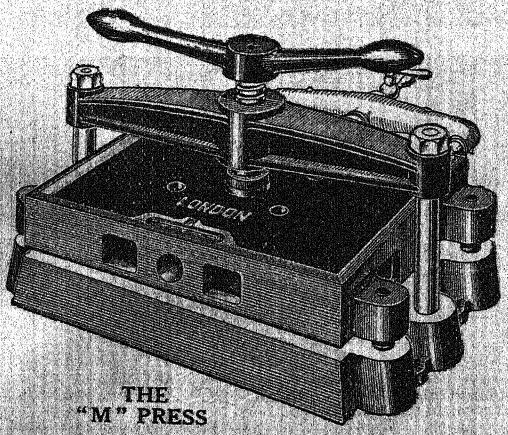
The Adhesive Dry Mounting Co., Ltd.

DRY MOUNTING MACHINE

THE "M" PRESS

A Dry Mounter for Amateurs and Professionals

This machine is suitable for amateur and professional photographers who go in for larger work than half-plate. It is the best value at the price.



THE "M" PRESS

PRICE.	*Nett.* £ s. d.
Heated by Gas	6 10 0
Heated by Electricity	10 10 0

Size of Heated Plate, 12 by 8 in. Width between the Arms, 13¼ in.
Will mount prints up to 12 by 8 in. on a mount 13½ by 10 in. in one pressure or a 12 by 15 print on a mount 13½ by 18 in. in two pressures.

ACCESSORIES FOR "M" MACHINE.

		s. d.
Mounting Covers, size 12½ by 9½ in.		
No. 1, Glazed Surface, Zinc	each	3 6
No. 2, Matt	"	3 6
Fixing Iron in Wood Handle	"	2 6
Spirit Lamp for Heating Fixing Iron	"	4 6
Gas Burner for ditto	"	7 6
Extra Thermometer for Gas Machines	"	3 6
" " " Electric Machines	"	5 0

Write for illustrated Catalogue post free.

27 & 28, Fetter Lane, London, E.C.4.

The Adhesive Dry Mounting Co., Ltd.

The IMPROVED MODEL DRY MOUNTER

"J" PRESS

Designed to meet the requirements of every Professional Photographer.



This new model Dry Mounter has a platen of 15½ in. by 12½ in., width between the arms 24½ in., allowing of a mount to be inserted 24½ in. full; a most convenient size for mounting 15 in. by 12 in. prints. Can be heated by gas or electricity. When ordering for electricity please **state voltage.**

	PRICES.	*Nett.* £ s. d.
Heated by Gas		**11 10 0**
,, ,, **Electricity**		**16 0 0**

ACCESSORIES FOR "J" MACHINE.

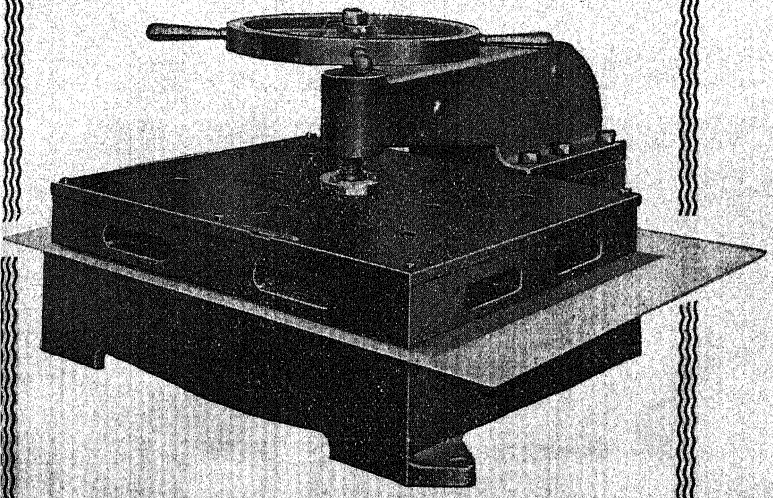
	s. d.
Mounting Covers, 16 by 13	
No. 1, Glazed Surface, Zinc	7 6
No. 2, Matt	7 6
Fixing Iron in Wood Handle	2 6
Gas Burner for Iron	7 6
Extra Thermometers	5 0
Electric Fixing Iron ... ... Nett	12 6

27 & 28, Fetter Lane, London, E.C.4.

The Adhesive Dry Mounting Co., Ltd.

DRY MOUNTING MACHINE

THE "V" PRESS



PRICES.

	Nett £	s.	d.
Heated by Gas	30	0	0
,, ,, Electricity	38	0	0

Size of Heated Plate - 21 by 25 in.

Will mount a print 20 by 24 in. on a mount 32 by 44 in. in one pressure, or a print 20 by 30 in. in two pressures.

ACCESSORIES FOR "V" MACHINE.

Mounting Covers, size 22 by 26 in.

	£	s.	d.
No. 1, Glazed Zinc	1	2	6
No. 2, Matt Zinc	1	2	6

Other Accessories same as "J" Press, see page 82.

This machine is specially designed for large showcard work, and has the advantage of unlimited dimensions either side.

27 & 28, Fetter Lane, London, E.C.4.

The Adhesive Dry Mounting Co., Ltd.

The "ADEMCO" ELECTRIC MOUNTING IRON



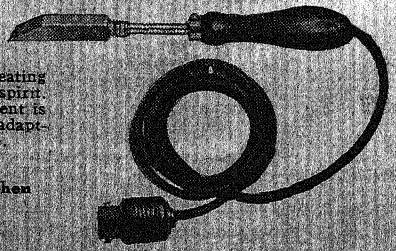
PRICE, complete with Thermometer, Fixing Iron, Metal Plate, Mounting Tissue, Mounts and Tints, packed in a convenient wooden box, together with 5 feet of flex.

WHEN ORDERING PLEASE STATE VOLTAGE.

COMPLETE 35/-.

ELECTRIC DRY MOUNTING FIXING IRON

Every Photographer using an Electric Dry Mounter will find this iron a great advantage over the old method of heating the fixing iron by gas or spirit. The consumption of current is exceedingly small, and is adapted for use on any voltage.



Please state voltage when ordering.

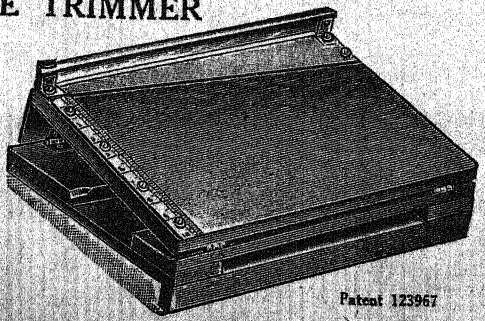
Price complete with 5 feet of flex, 12/6 nett.

27 & 28, Fetter Lane, London, E.C.4.

The Adhesive Dry Mounting Co., Ltd.

MERRETT'S PATENT AUTOMATIC VISIBLE TRIMMER

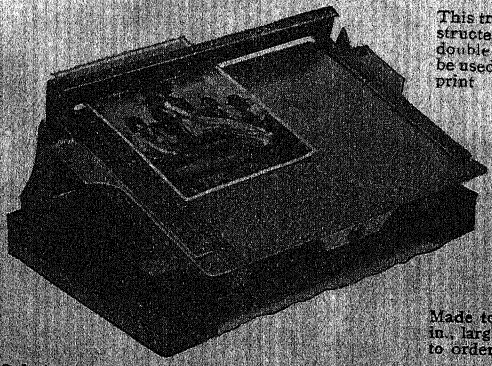
The most efficient and practical Print Trimmer on the Market. Will trim prints equally well wet or dry



Patent 123967

	s.	d.		s.	d.
8½ in. cut (21 cm.)	12	6	15½ in. cut (41 cm.)	55	0
10 „ „ (25 cm.)	25	0	24 „ „ (60 cm.)	90	0
12½ „ „ (31 cm.)	35	0	Larger sizes up to 54 in. made to order		

THE NEW MERRETT MARGIN TRIMMER



This trimmer is constructed to serve a double purpose, it can be used as an ordinary print trimmer, also converted into a Margin Trimmer, to trim margins from ⅛ to ⅝ of an inch

Price 25/- nett

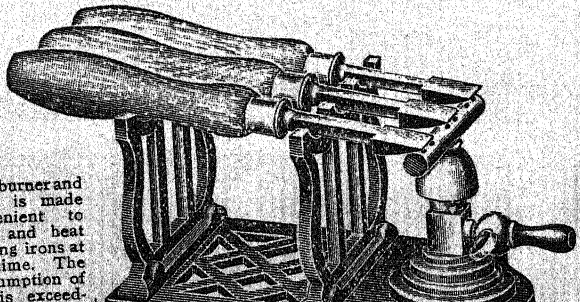
Made to cut up to 8½ in., larger sizes made to order.

Sole Agents for Merrett's Trimmer, Margin Trimmers & Trimmerette.

27 & 28, Fetter Lane, London, E.C.4.

The Adhesive Dry Mounting Co., Ltd.

NEW TRIPLE GAS BURNER AND HOLDER FOR FIXING IRONS



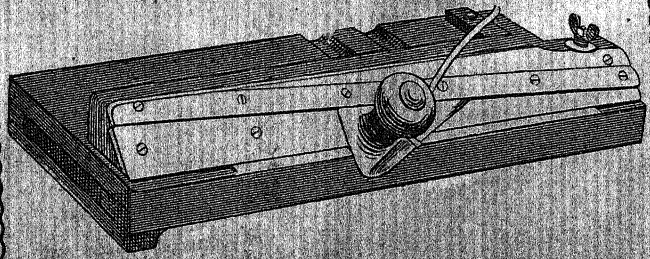
This burner and stand is made convenient to hold and heat 3 fixing irons at one time. The consumption of gas is exceedingly small, the flame of which is adjusted by a tap at the base of gas stand.

Price 10/6 **Irons extra, 2/6 each.**

THE "MERRETT" MOUNT BEVELLER

All British throughout.

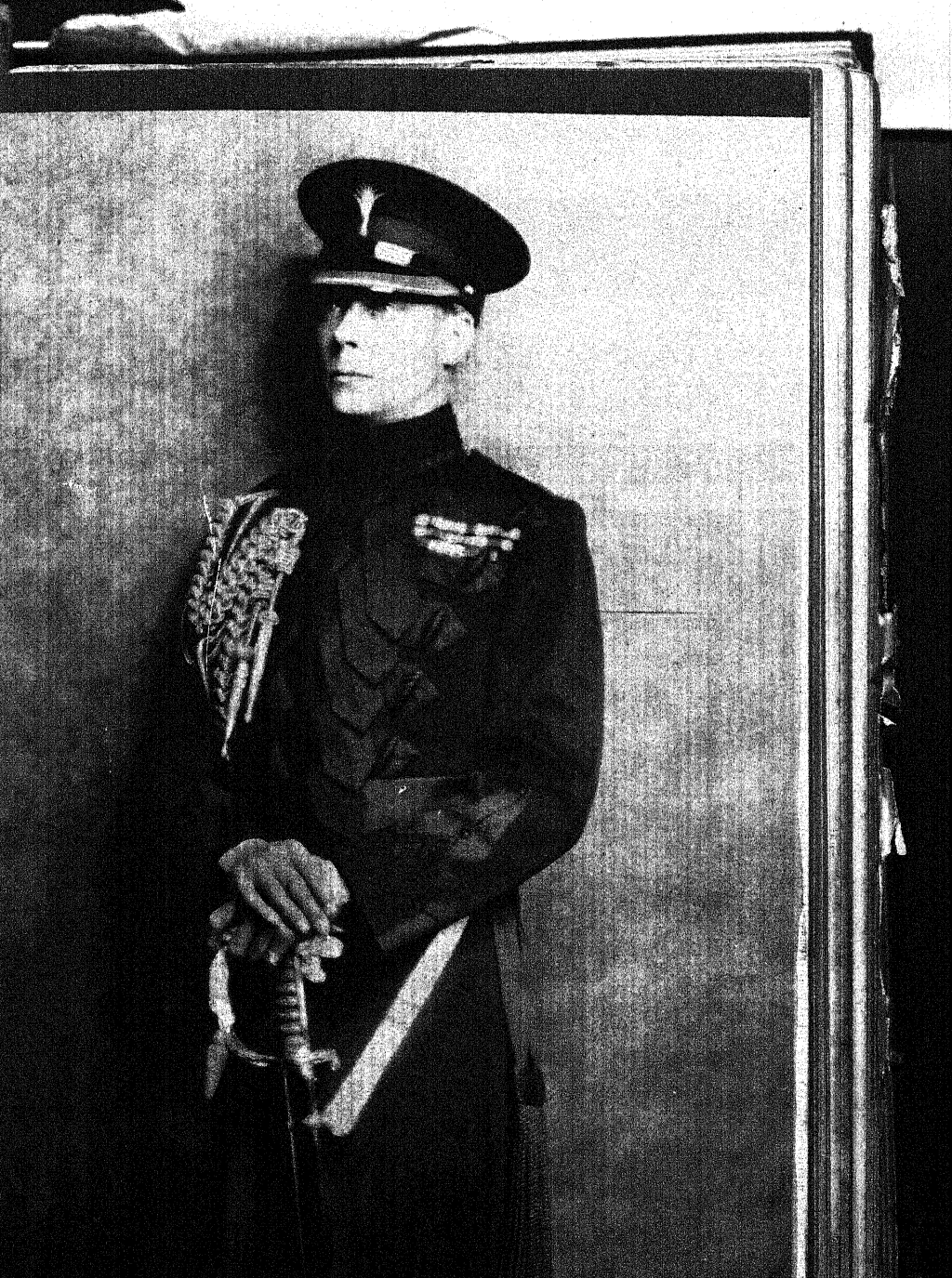
For Hand Bevelling Photographic Mounts or Showcards.

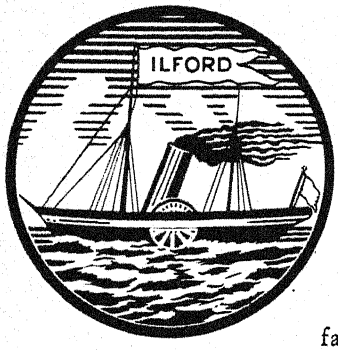


	Made in the following sizes					
	8 in.	10 in.	12 in.	15 in.	18 in.	25 in.
Price	30/-	35/-	40/-	50/-	60/-	80/-

Spare Knives for all sizes can be supplied.

27 & 28, Fetter Lane, London, E.C.4.





REGISTERED
TRADE MARK

THE WORLD USES ILFORD PLATES - PAPERS FILMS

Ilford Plates, Papers and Films are famous throughout the world for their complete reliability in all climates and under all conditions. They are unrivalled in the comprehensiveness of the range in which they are made, covering all the requirements of amateur, portrait, press and commercial photographers, process workers, lithographic printers and workers in the sciences.

Brief particulars of some of the grades of plates, papers and films made by Ilford Limited are given in the following pages, but readers are invited to acquaint themselves by means of Ilford publications of the comprehensiveness and utility of Ilford and Selo materials.

Ilford Limited are at the service of photographers all over the world, and will gladly advise on any photographic problem submitted to them.

ILFORD LIMITED
ILFORD LONDON



Negative on Golden Iso-Zenith Plate.
Hermann Schieberth, Vienna.

ILFORD

PLATES & FILMS

for Portraiture . .

For daylight, half-watt or any other type of studio lighting there is an Ilford Plate or Film to assist the portrait photographer in his work—to ensure the maximum degree of success and to reduce afterwork on the negative or print.

A new grade of Panchromatic Film, by name, Ilford Portrait Panchromatic Film, has been introduced this year and is of special value with half-watt lighting. This new film has a balanced colour sensitivity whereby a correct rendering of blue eyes and blue fabrics is assured, as well as a natural reproduction of red materials. Retouching is thereby reduced to a minimum.

Ilford Plates and Films for Portraiture

Soft Gradation Panchromatic Plate	Speed	700 H. & D.
Golden Iso-Zenith Plate	„	1400 H. & D.
Iso-Zenith Plate	„	700 H. & D.
Iso-Record Plate	„	500 H. & D.
Portrait Panchromatic Film	„	2000 H. & D.
Hypersensitive Panchromatic Film	„	2000 H. & D.
Hyperchromatic Film	„	1500 H. & D.
Portrait Film (Ortho Fast)	„	700 H. & D.
Portrait Film (Medium Speed)	„	350 H. & D.

ILFORD LIMITED
ILFORD LONDON



Negative on Ilford
Portrait Panchromatic Film.
Walter Bird.

ILFORD
PLATES & FILMS
for Commercial Photography

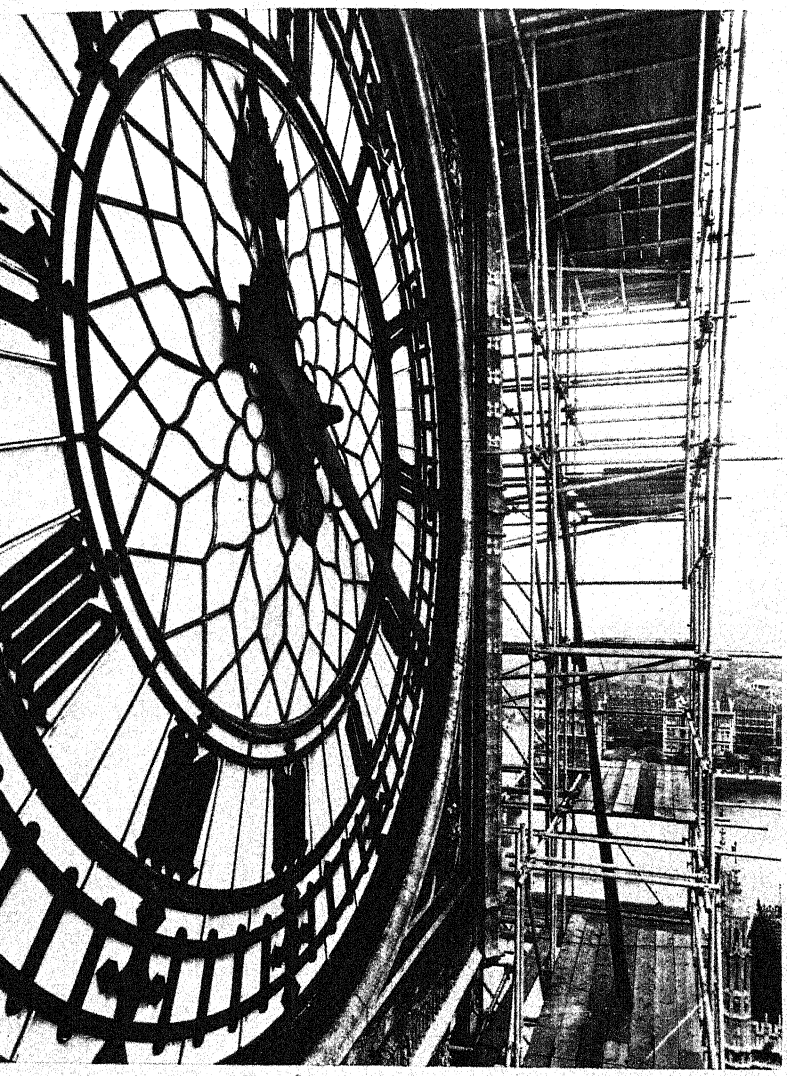
The commercial photographer, whether he specialises in Engineering, Architecture, Fashion, or any other phase of commercial photography, has at his disposal a very wide range of Ilford materials, all of which are of the highest quality and consistently reliable.

There is no subject which cannot be photographed successfully, as the range of Ilford products for commercial photography covers slow, medium and fast orthochromatic and panchromatic plates and films. A few of these grades are listed below, but a complete list will be found in the Ilford Process Catalogue, free on application.

Plates & Films for Commercial Photography

Ordinary Plate	Speed	70 H. & D.
Soft Ordinary Plate	„	80 H. & D.
Chromatic Plate	„	135 H. & D.
Special Rapid Plate	„	270 H. & D.
Special Rapid Panchromatic Plate	„	400 H. & D.
Soft Gradation Panchromatic Plate	„	700 H. & D.
Hypersensitive Panchromatic Plate	„	2500 H. & D.
Fine Grain Ordinary Film	„	45 H. & D.
Soft Ordinary Film	„	80 H. & D.
Commercial Ortho Film	„	250 H. & D.
Hyperchromatic Film	„	1500 H. & D.
Hypersensitive Panchromatic Film	„	2000 H. & D.

ILFORD LIMITED
ILFORD LONDON



Negative on Ilford Soft Gradation Panchromatic Plate.
G. Marshall Smith.

ILFORD
PLATES & FILMS
for Press Photography

The special requirements of press photographers have had the careful consideration of Ilford Limited and the range of Plates and Films available provides material which is unsurpassed for the work it has to do. Ilford Plates and Films for Press Photography combine high speed with comparative fineness of grain, freedom from veil, great latitude and rapid developing and fixing. The emulsions are hardened to withstand damage and the heating effects of enlargement while wet.

The pressman who uses a miniature camera is fully catered for by the three special "fine grain" Selo Films. These films are supplied in a daylight cassette of new design which obviates scratching and friction, and in unspooled lengths for darkroom loading.

Ilford Plates & Films for Press Photography

Double-X-Press Plate	Speed	1500 H. & D.
Press (Ortho) Plate	,,	700 H. & D.
Hypersensitive Panchromatic Plate	,,	2500 H. & D.
Soft Gradation Panchromatic Plate	,,	700 H. & D.
Infra-Red Plate	,,	100 H. & D. (with filter)

Selo Fine Grain Films for Miniature Cameras

Selochrome Special Fine Grain Film,	Speed	400 H. & D.
Selo Extra Fine Grain Panchromatic Film	,,	500 H. & D.
Selo Fine Grain Hypersensitive Panchromatic Film	,,	1000 H. & D.

ILFORD LIMITED
ILFORD LONDON



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ILFORD LONDON

ILFORD

Products for the Process and Photomechanical Industries

There is an Ilford grade of plate, paper or film for every process connected with the Printing, Process and Photomechanical Industries. These products have a reputation which is second to none for reliability and suitability for their work. They are famous in every country in the world. In England the leading houses rely on Ilford Plates and Films; they know that every batch has been tested not only by laboratory methods, but under everyday working conditions, thus guaranteeing a consistent high standard of quality and ensuring the maximum satisfaction.

In the United States, Canada, Australia, India, China and throughout most of Europe leading colour printers, blockmakers, photo-lithographers and gravure printers insist on Ilford Panchromatic Plates. It is significant that those firms which are renowned for the highest quality work use entirely Ilford Products.

Users of process materials are invited to send for the new Ilford Catalogue, "Ilford Products for the Process and Photomechanical Industries," which, besides detailing the grades of materials suitable for particular classes of process work, contains much useful technical information for the Process Worker.

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ILFORD LONDON



ILFORD LIMITED
ILFORD LONDON

ILFORD

PLATES & FILMS for Scientific Work

Ilford Limited manufacture for Scientific workers many special grades of Plates and Films which are the result of continuous research and careful study of the particular requirements of the various branches of scientific photography. A complete list of these special grades is contained in the Ilford booklet, "Photography as an Aid to Scientific Work," which will be forwarded on request.

ILFORD

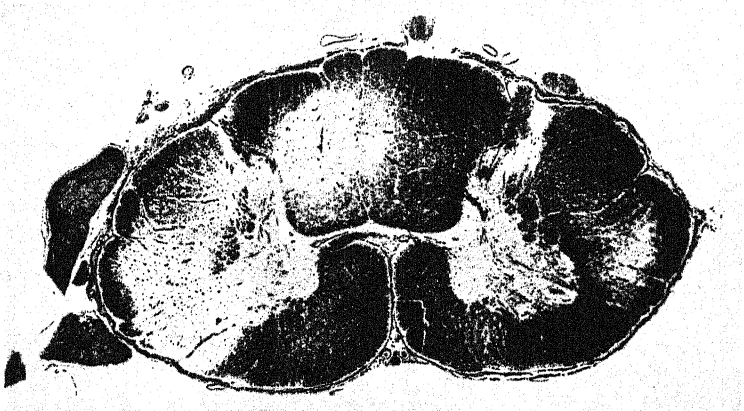
Films for Aerial Work

Ilford Aerial Films have proved remarkably successful in all parts of the world, and are used consistently for air survey work by all the leading companies. Each type of film is supplied in sizes to fit all makes of cameras.

The four types of Ilford film now available fill every requirement of the aerial photographer, and are as follows:—

Type 1.	Hypersensitive Panchromatic Speed	1200 H. & D.
Type 2.	Panchromatic of exceptionally fine grain	„ 800 H. & D.
Type 3.	Orthochromatic - -	„ 1000 H. & D.
Type 4.	Infra-Red - - -	„ 75/100 H. & D.

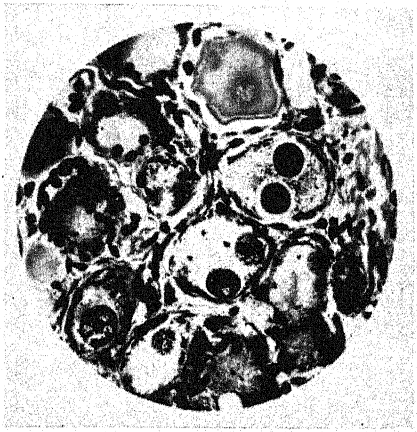
ILFORD LIMITED
ILFORD LONDON



Transverse section of Spinal Cord in disseminated Sclerosis. × 10.
Negative on Ilford Rapid Process Panchromatic Plate.



Streptococcus Pyogenes in Pus Film.
Gram stained.
Negative on Ilford Rapid Process Panchromatic Plate.
× 900



Multinucleated Nerve Cells in Ganglio Neuroma of Adrenal.
Stained Haemalum and Eosin.
Negative on Special Rapid Panchromatic Plate. × 240

Photomicrographs by courtesy of T. C. Dodds, Esq., Department of Pathology, Edinburgh

ILFORD
PLATES & FILMS
for Amateur Photography

The fame of Ilford Auto-Filter, Special Rapid and Special Rapid Panchromatic Plates has spread far and wide. They are the first choice of the discriminating amateur photographer, who has learnt to rely on them at all times under all conditions. They are characterised by extreme cleanness in working, excellent gradation, great latitude, freedom from mechanical defects and exceptional keeping qualities.

There is an Ilford plate for every amateur requirement and a brief list is given below. Full details of all grades and much interesting photographic information, formulæ, etc., will be found in the booklet, "Ilford Plates and Films," which will be supplied free on request.

Plates & Films for Amateur Photography

Special Rapid Plate	Speed	270 H. & D.
Auto-Filter Plate	„	400 H. & D.
Special Rapid Panchromatic Plate	„	400 H. & D.
Soft Gradation Panchromatic Plate	„	700 H. & D.
Hypersensitive Panchromatic Plate	„	2500 H. & D.
Hyperchromatic Film	„	1500 H. & D.
Hypersensitive Panchromatic Film	„	2000 H. & D.

ILFORD LIMITED
ILFORD LONDON



Negative on Selochrome Roll Film.
Photographic Advertising.

SELO
FILMS

In the Selo range of roll films there are eight distinct types—each of proved and outstanding quality in its class, and each having a particular application as well as a general use.

The first Selo Film, which achieved a great success because of its high speed and general good qualities, is still universally popular, and for all ordinary snapshot purposes there is no better film.

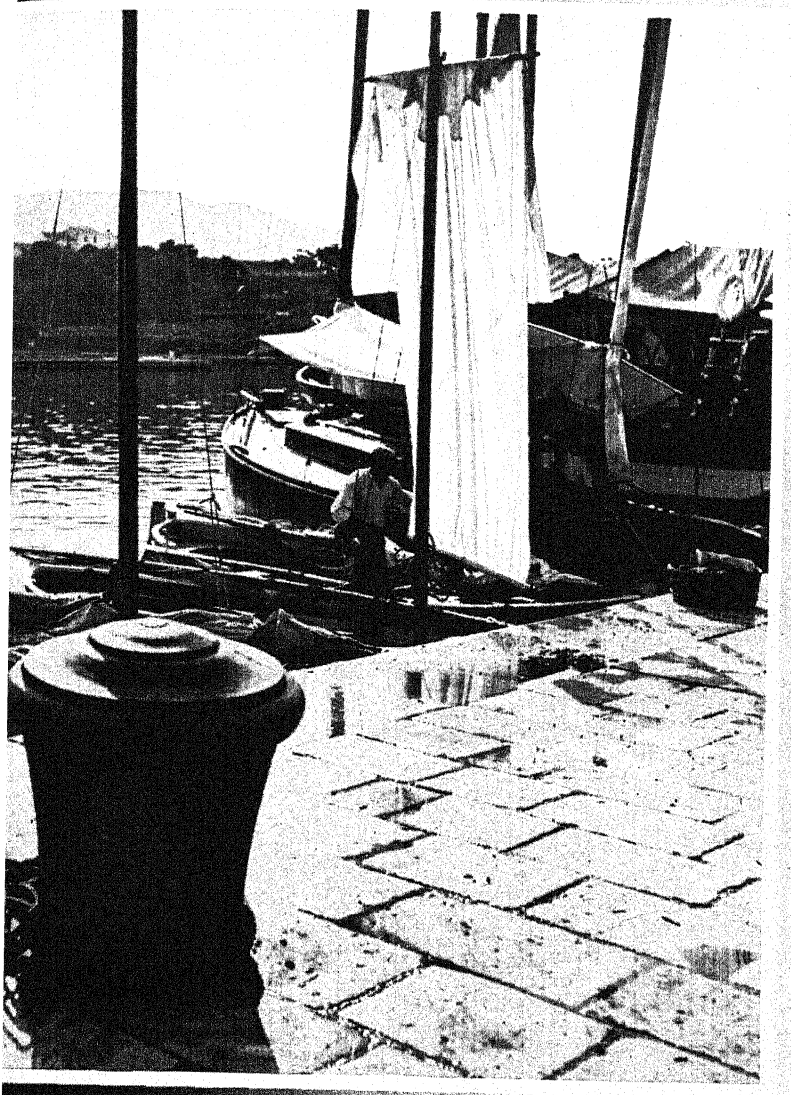
For the critical amateur, Selochrome, which is orthochromatic, multi-coated and anti-halo backed, offers greater facilities for better photography and is well worth the small extra price. It has abnormal latitude so that considerable errors in exposure are compensated for.

Selo Panchromatic Films—Fine Grain and Hypersensitive—are completely colour sensitive and should be used on all occasions when a true colour rendering in monochrome is required. For photography indoors by artificial light they should always be used. The Fine Grain Film has not the extreme speed of the Hypersensitive Panchromatic Film, but it has a specially fine grain which makes it particularly suitable for miniature cameras taking ordinary films.

In the series of Selo Films for Leica and other miniature cameras using 35 mm. perforated film there are Selochrome, (Fine Grain Orthochromatic), Selo F.P. Film (Extra Fine Grain Panchromatic), and Selo H.P. Film (Fine Grain Hypersensitive Panchromatic).

Full details of these and all Selo Films are contained in the booklet, " Selo Films for Perfect Pictures," which is profusely illustrated with reproductions from Selo Film negatives and many diagrammatic drawings.

ILFORD LIMITED
ILFORD LONDON



Negative on
Selochrome Roll Film.

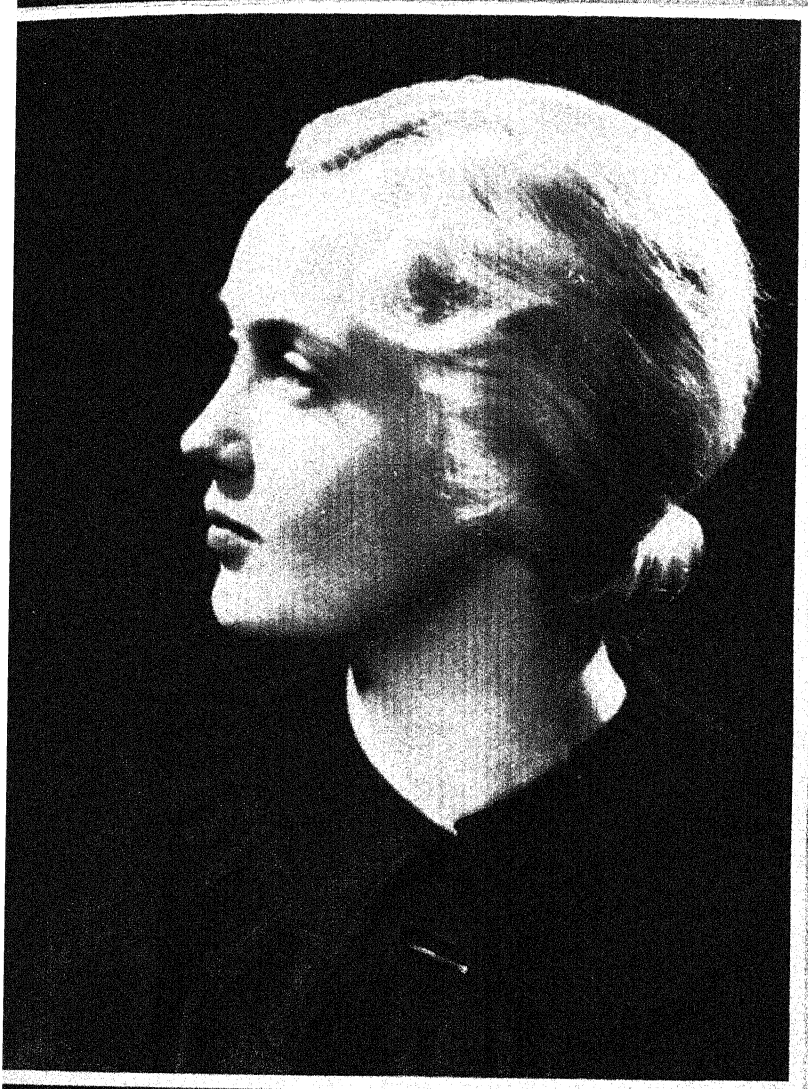
ILFORD
BROMIDE PAPER

Ilford Bromide Paper provides for every requirement of the photographer, whether for professional, commercial, scientific, or amateur purposes. The professional photographer has a wide selection of artistic surfaces to satisfy the most discriminating of his clientele. For scientific and commercial photography entailing much reproduction work there are Glossy and Semi-Matt grades available, which are supreme in their particular classes. For exhibition work there is an unexcelled variety of grades available, all of which are calculated to increase the exhibitor's chances of success.

A new series of Ilford Bromide Paper for artistic picture-making—Lustre Bromide—has just been introduced, and has attracted much attention from discriminating exhibitors. These papers are specially suited to enlargement from small-scale negatives.

Ilford Bromide Paper is of unvarying consistency and unparalleled latitude, it gives fine blacks and pure whites by ordinary development, and rich sepia tones by sulphide and hypo alum toning processes.

ILFORD LIMITED
ILFORD LONDON



Negative on Ilford
Portrait Panchromatic Film.

ILFORD
X-RAY FILM
(DOUBLE COATED)

Ilford X-Ray Film is coated with an emulsion which combines speed to X-Ray, speed to Intensifying Screens, excellent contrast, freedom from fog and quick fixing to a degree hitherto unknown. The same film may be used with or without Intensifying Screens and negatives of excellent quality, full of detail, are obtainable.

Ilford X-Ray Film is supplied on both nitrate and acetate bases. The latter is wholly cellulose acetate, thus giving maximum security against fire risks. Both types are available in White, Clear and Matt and Blue, Clear and Pearl.

Ilford X-Ray Dental Films are supplied in two grades—Standard and Contrast—both of unimpeachable quality.

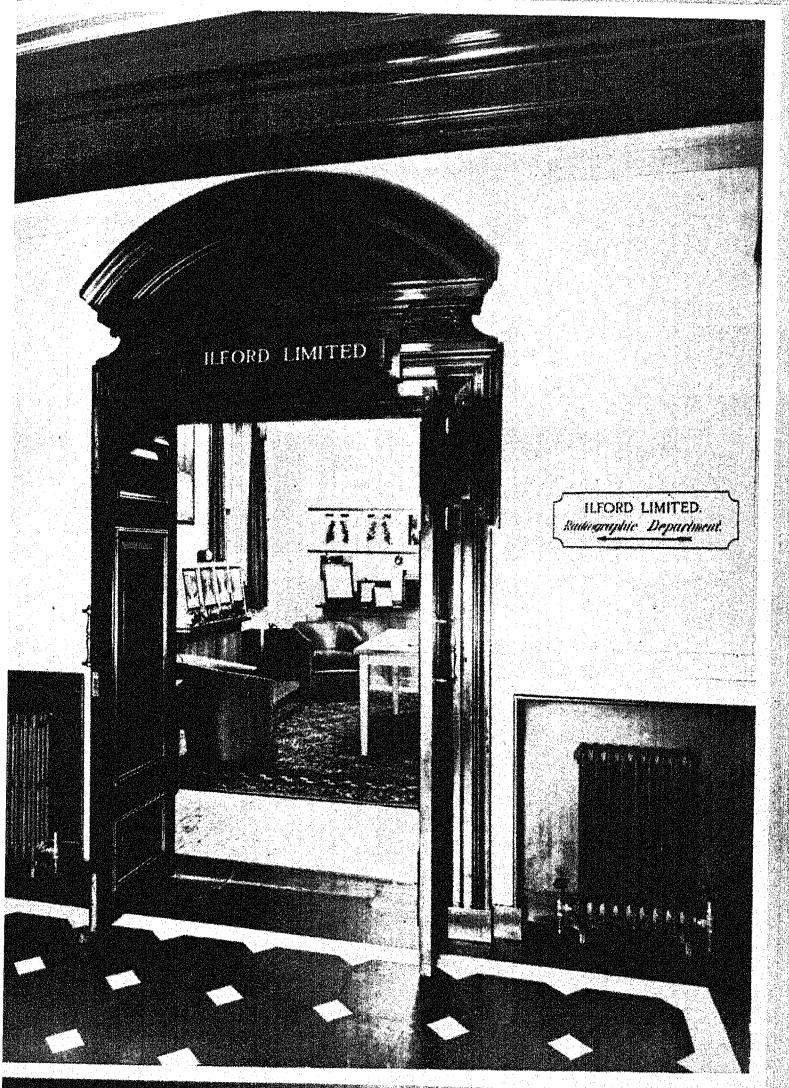
ILFORD
Radiographic Department

The Ilford Radiographic Department at Tavistock House (North), London, W.C.1, has been designed and opened with the object of giving every possible service and assistance on the photographic side of Radiography and Clinical Photography.

The Ilford Radiographic Department has been equipped and furnished on the most modern principles, and users of X-Ray Film and those interested in any application of photography to medical work are cordially invited to visit it at any time.

Practical demonstrations can be given and expert advice obtained on any particular problem.

ILFORD LIMITED
ILFORD LONDON



ILFORD LIMITED
ILFORD LONDON

SELO 16 mm.
Reversal Safety Cine Film

The final test of any Cine Film is the quality of the projected image and Selo 16 mm. Reversal Film is unsurpassed for brilliant highlights and rich black shadows.

The emulsion is fully panchromatic; it is "clean," without any residual veil and truly transparent. Remarkable grain fineness ensures pictures of needle sharpness when projected to large screen sizes.

The film base is tinted slightly blue which exercises a most valuable anti-halo influence when shooting and also corrects the unavoidable yellow of the projection light on the screen.

SELO 9.5 mm.
Reversal Safety Cine Film

Every 9.5 cine camera user can now enjoy the advantages of SELO—the master film for home movies.

True colour rendering, exceedingly fine grain, a fast "plucky" emulsion and wide latitude all go to make Selo 9.5 mm. Reversal the perfect film for the 9.5 mm. cine photographer.

As in the 16 mm. film, the base is tinted blue and projection brilliance is remarkable.

ILFORD LIMITED
ILFORD LONDON

ILFORD
COLOUR FILTERS

The manufacture of Ilford Colour Filters requires a high degree of manual dexterity and necessitates continual control by our chemists and physicists in order to maintain the constancy of these products. Testing is continuous at all stages of manufacture and purchasers of Ilford Filters can have confidence that they are obtaining articles of precision. The Filter department, moreover, works in close co-operation with the Laboratories responsible for making the emulsions, thus ensuring the maximum efficiency of every filter.

Ilford Colour Filters give the best possible correction with the minimum exposure.

Not only is it possible to supply colour filters for Ilford colour sensitive materials and for every type of photographic purpose, but special filters can be made to suit customers' requirements, whether for photographic purposes or not.

It is impossible to enumerate here the filters made by Ilford Limited, but it may be said that they cover every possible photographic requirement. A complete list of Ilford Filters and their uses will be found in the brochure, "Ilford Colour Filters, Holders, Wedge Screens and Safelights," in which also are details and prices of filter sets, adjustable holders and mounts, wedge screens and safelights.

ILFORD LIMITED
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ILFORD LIMITED

HEAD OFFICE:
ILFORD, LONDON

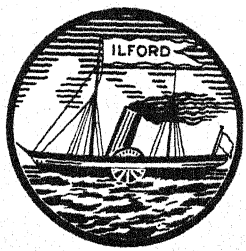
Telephone: ILFORD 3000 (20 lines)
Telegrams: PLATES, PHONE, ILFORD

Codes:
A.B.C. 4TH, 5TH & 6TH EDITIONS
MARCONI INTERNATIONAL
BENTLEY'S COMPLETE PHRASE CODE
BENTLEY'S SECOND PHRASE CODE
ILFORD LIMITED "PRIVATE"

Factories:

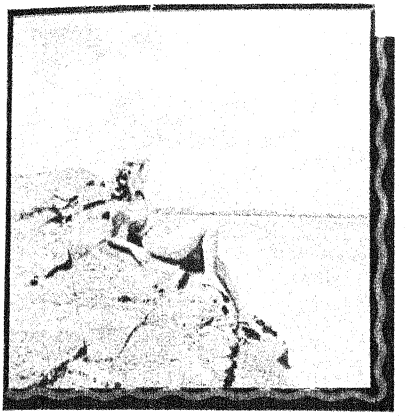
ILFORD	WARLEY
PARK ROYAL	WATFORD
MOBBERLEY	ELSTREE

Agencies and Branches all over the world.

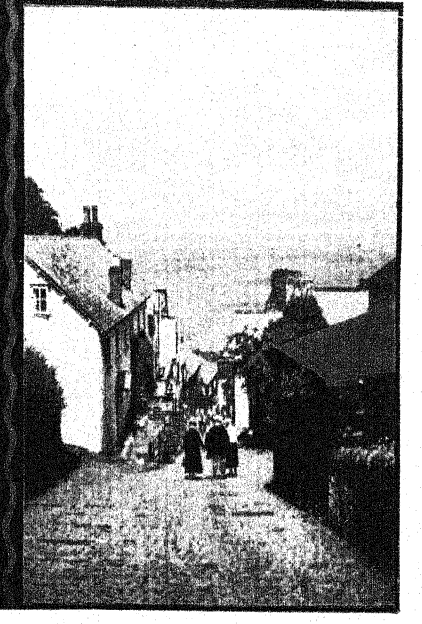


REGISTERED
TRADE MARK

DUFAYCOLOR



ROLL FILM
FILM PACKS
FLAT FILM
CINE FILM



DUFAYCOLOR has established itself quickly with every class of photographer. The amateur has found a new and enthralling interest in his hobby; professional and commercial photographers have been provided with facilities for additional highly remunerative work; process workers and colour printers find Dufaycolor a great assistance in colour work, shortening time of production and reducing working costs. In clinical photography and other forms of scientific work Dufaycolor has proved of inestimable value.

All phases of Dufaycolor are dealt with fully in "The Dufaycolor Process," price in England 6d., post free 8d., obtainable from Ilford Limited, Ilford, London.

ILFORD LIMITED


DU
ILFORD

The Dufaycolor Process is a quick and simple method of making natural colour transparencies on non-inflammable film. There are practically no limits to the uses of Dufaycolor. The amateur photographer can make his pictures in colour without any additional apparatus and at very little extra cost. He can expose Dufaycolor just as successfully by artificial light as by daylight.

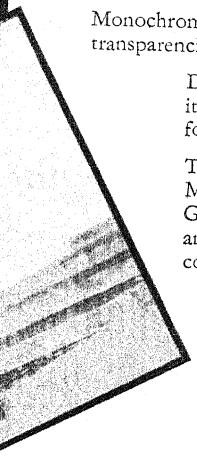
Dufaycolor has many valuable advantages in other branches of photography. Its use enables full colour reproductions of indoor and outdoor subjects to be made with ease and simplicity at a reasonable cost.

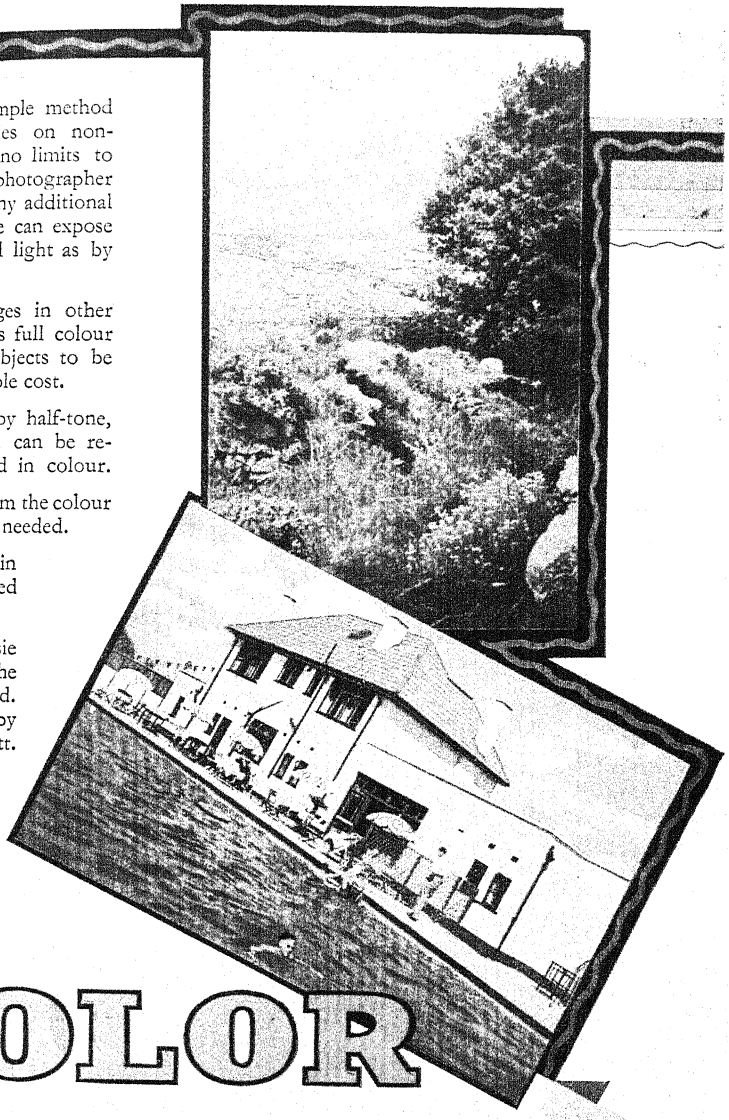
Dufaycolor is suitable for reproducing by half-tone, photolithography and photogravure, and can be re-produced in monochrome where not required in colour.

Monochrome negatives can be made from the colour transparencies if black and white prints are needed.

Dufaycolor is almost unlimited in its application and unsurpassed for the quality of its results.

The reproduction of Miss Jessie Matthews is by courtesy of The Gaumont British Corporation Ltd. and the bathing subjects by courtesy of Highley Bennett.





FAYCOLOR

LIMITED ILFORD LONDON



Dufaycolor is available in two forms.

Type D.1. Roll Films and Film Packs and Films for Leica and similar cameras. (No attachments to the camera are required with this film when exposed to daylight. In artificial light a filter is necessary).

Type D.2. Flat Film and 16mm. Cine Film. (This type requires a a filter under all conditions. A gelatine daylight filter is supplied free with each box of film).

The following publications dealing with Dufaycolor are available :—

The Dufaycolor Process, price 6d., post free 8d.,
Dufaycolor—16 mm. Cine film.
Lantern Slides in colour by the Dufaycolor Process.
Dufaycolor in Artificial Light.
Dufaycolor Roll Films and Film Packs.

Dufaycolor is sensitized by Ilford Limited and sold and distributed by them in the British Empire, British Mandated Territories and Egypt.

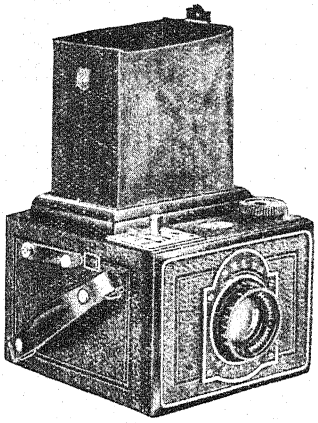


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DUFAYCOLOR

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Suppliers to all countries except Great Britain.

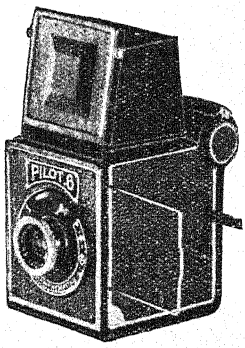


K.W. ROLL FILM REFLEX

The "K.W." Reflex is the smallest Roll Film Reflex camera taking standard 3¼×2¼ in. roll film. It is equipped with focussing hood, surface-silvered mirror and focussing screen of extra fine ground glass, and shows the subject as clearly and sharply as the most expensive reflex cameras. Shutter speeds 1/25th, 1/50th and 1/100th second, also Brief and Time exposures. Dimensions 4⅝×3½×4⅝ ins. Weight about 31 ounces.

The "K.W." Reflex camera is supplied with *f*/6.3 Anastigmat lens with rotating diaphragms, also with Steinheil *f*/4.5 Actinar Anastigmat lens with iris diaphragm, flexible wire release and leather shoulder strap.

"PILOT 6" ROLL FILM REFLEX



This new Roll Film Reflex camera takes 12 exposures 2¼ ins. square (6 × 6 cm.) on 3¼×2¼ (8 exposure) roll film. The "Pilot 6" is fitted with a tall focussing hood with a magnifier for fine focussing, also a full-size wire frame direct vision finder for using the camera at eye level. Shutter speeds 1/25th, 1/50th and 1/100th second, also Brief and Time. Dimensions 3×3½×4 ins. Weight about 22 ounces, press metal body.

The "Pilot 6" is supplied with *f*/6.3, *f*/4.5 and *f*/3.5 Anastigmat lenses with iris diaphragm, flexible wire release and carrying strap.



THE K.W. EPISKOP

The "K.W." Episkop is a wonderful new picture projector, specially designed for use in the home. It is mainly intended for projecting miniature size prints, up to 9×9 cm., without having to make lantern slides; it can also be used for projecting cigarette cards, postcards, small flat objects, book illustrations or colour prints of any kind. No special wiring is required for the Episkop—it may be used on any electric lighting circuit.

Write for lists to the Sole Distributors for Great Britain

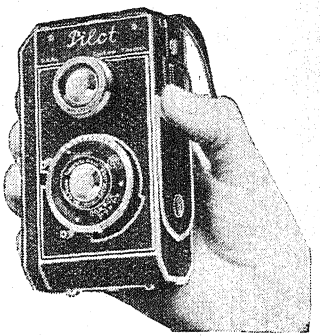
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Suppliers to all countries except Great Britain.

THE "PILOT" MINIATURE ROLL FILM REFLEX

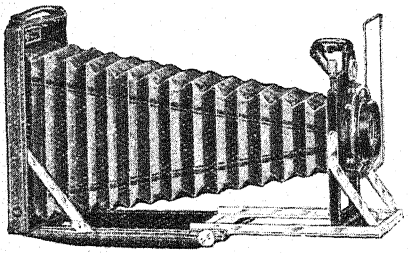


Gives 16 exposures 3 × 4 cm. on V.P. size film of any make. At the touch of a button the "Pilot" springs open to "infinity," the hood is automatically erected and the camera is ready for use. A simple lever movement changes the film.

Automatic exposure indicator. Magnifier over ground glass screen for ultra-sharp focussing. Additional finder for upright eye-level pictures. Supplied with high grade anastigmat lenses, *f*/2, *f*/3.5, *f*/4.5, in Rapid Compur shutter. Dimensions 5 × 2¼ × 1½ ins. Weight including case, 20 ounces.

THE "PATENT ETUI" CAMERA

The thinnest and lightest of all cameras



6.5 × 9 cm. (3½ × 2½ ins.). Weight 16 ozs. including lens and shutter. Outside dimensions, ⅝ × 3½ × 5 ins. Maximum extension (lens diaphragm to focussing screen), 7⅝ ins.
9 × 12 cm. (4¼ × 3½ ins.). Weight 25 ozs. including lens and shutter. Maximum extension (lens diaphragm to focussing screen), 10½ ins.



Takes large pictures direct, yet is small, slim and light. Two movements only make it ready for use. On opening a "Patent Etui" camera the lens front is as firm as a rock. This results from the special arrangement of struts. The exceptional rigidity of the baseboard is due to its peculiar convex shape, and it is a feature which allows of the unequalled slimness of the "Patent Etui" camera. By using the very best materials and employing the finest workmanship, every part of the camera has been made both light in weight and handsome in appearance. A "Patent Etui" camera will never be an incumbrance and is so reliable and certain in use as to be a source of infinite pleasure.

FOR PLATES, FILM PACKS OR ROLL FILMS

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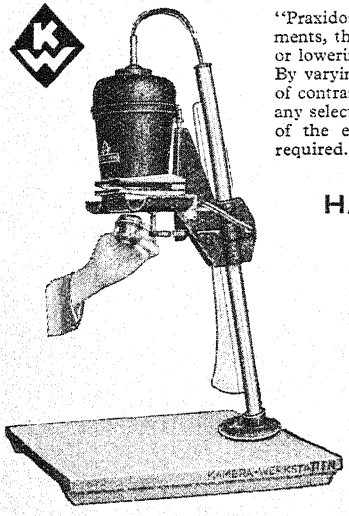
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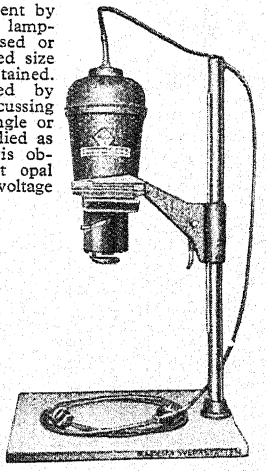
"PRAXIDOS" *automatic* ENLARGERS



"Praxidos" Automatic Enlargers give critically sharp enlargements, the degree of enlargement being determined by raising or lowering the lamphouse—the image is always needle-sharp. By varying the illumination, enlargements of different degrees of contrast can be obtained. Enlargements can be made from any selected part of the negative of any size up to the capacity of the enlarger. Single or double condensers supplied as required. For negatives, 4 × 4, 6 × 6 and 6 × 9 cm.

HAND-FOCUSSING "PRAXIDOS"

The hand-focussing "Praxidos" Vertical Enlarger can be set for any degree of enlargement by releasing a lever. The lamphouse can then be raised or lowered until the desired size of enlargement is obtained. Focussing is completed by means of the helical focussing mount of the lens. Single or double condensers supplied as required. Illumination is obtained from a 100-watt opal lamp. Please state voltage when ordering.



BIG ENLARGEMENTS FROM 35 mm. NEGS.

The 4 × 4 cm. Automatic "Praxidos" gives 10 times enlargements, namely, 14 × 9½ ins. from Leica size negatives, when used with the lens listed with the enlarger or when using the standard 5 cm. focus Leica or Contax lens. The 3½ × 2½ ins. Automatic "Praxidos" gives 12 times enlargements, namely 17 × 11 ins. from Leica size negatives if the short focus lens as listed is used, or 15 times enlargements, namely, 21 × 14 ins., if a normal 5 cm. focus Leica or Contax lens is used in place of the listed lens.
The 1936 "Praxidos" Trade Enlarger will give 23 times enlargements, namely 36 × 24 ins., with the lens listed for negatives of Leica size. For negatives, 10 × 15 cm., 9 × 12 cm. and smaller.

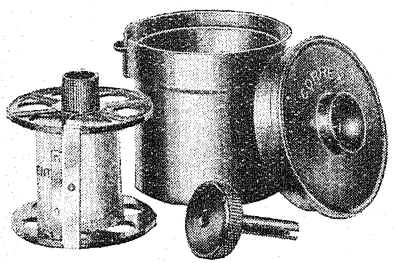
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"CORREX"

ROLL FILM DEVELOPING TANKS



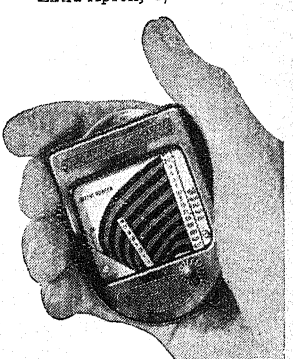
DEVELOP YOUR FILMS THE "CORREX" WAY

The "Correx" Roll Film Developing Tank represents the simplest, safest and most certain way of developing roll films. Any amateur using a "Correx" tank according to the simple instructions can be sure of properly developed negatives.

		s.	d.
No. 731.	"Correx" Tank for V.P. films	25	0
No. 733.	"Correx" Tank for 2½×3½ in. films	25	0
No. 736.	"Correx" Tank for 2½×4½ in. films	30	0
	"Correx" Thermometer (Fahr.) ...	3	0
	"Correx" Developing Powders, ½-dozen	1	6

V.P. and 3½×2½ in. films can be developed in the same "Correx" Tank if an extra Reel and "Correx" Apron of the required size is used. Extra Reel, 8/- Extra Apron, 8/-

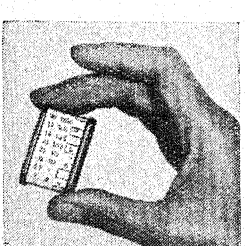
"PRINSEN" ELECTRIC EXPOSURE METER



The "Prinsen" Electric Exposure Meter is the smallest exposure meter controlled by a photo-electric cell. Its efficiency and accuracy are remarkable; due to the fact that the human element is eliminated, calculations are avoided and the reading depends entirely upon the actinic quality of the light.

Carried easily in the vest pocket the "Prinsen" needs only one simple adjustment according to the speed of the plate or film in use. Then, with its lens presented at the subject to be photographed, it registers the correct exposure at any lens aperture instantly.

Price	**£3**	**3**	**0**
Ever-Ready Pocket Case ...	**0**	**5**	**0**
Ever-Ready Case with Sling ...	**0**	**7**	**6**



"LEUDI" The Simplest, Smallest and Cheapest, EXPOSURE METER

Measuring only 1½×1×⅝ ins.—less than half the size of an ordinary pocket lighter!—the "Leudi" is easily the smallest, neatest and simplest exposure meter made. As simple as it is small, and as efficient as it is simple, it is the finest value in exposure meters that you can possibly obtain. It has no lens, needs no focussing, no reference to tables; is as effective indoors as out-of-doors, and can be used with plates or film of any make.

PRICE ONLY 5/-

THE CINE LEUDI

Case 1/-

For use with any kind of cine camera. **Price Only 6/-**

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HALIE SCREENS

HALIE-BETRIEB. B. KAMNITZ, CZECHOSLOVAKIA



HALIE SOFT GRAIN SCREENS

Three screens are available :

A. Fine grain, for slight softening.
B. Medium grain, with an effect similar to that of a printed picture.
C. Coarse grain, for strong and massive effects.

These screens render retouching unnecessary.

HALIE ETCHING SCREEN

The size and width of the lines increase progressively with the size of the screen, so that the image character appears the same when prints of various sizes are viewed from their proper distances. All sizes up to 10 × 8 in. are provided with a black border, giving a white edge to the print.

HALIE OIL PAINTING SCREENS

This printing screen produces an image of characteristic and unique appearance ; soft, irregular and very plastic. All monotonous flat areas in the negative are broken up and enlivened in a remarkable way. Supplied in two grades, Soft and Coarse.

HALIE LINEN SCREENS

These screens give a fine linen texture effect to the print, giving the impression of being printed on linen cloth. Supplied in pairs, one each of "fine" and "coarse" texture, in a folder.

Halie Screens will be found to be most useful in the search for special artistic effects. The critical worker will find that their use enables him to give a particular character to his prints, while the most ordinary of photographs can often be materially improved by using a judiciously chosen printing screen.

Most photographers—particularly amateurs—use small negative sizes and experience grain to some extent in enlarging, so that the ideal device for softening contrast should also be capable of producing a regular grain in the print rather than the irregular grain produced by the negative. By simply placing one of the Halie Screens over the printing paper during the printing or enlarging process, the image is given a character which makes it different and more pleasing to the eye than a "straight" print.

HALIE PHOTO TITLING OUTFIT

No more writing on the negative. Black titles on the margin of the photographic print. The title on the printing mask. Wording of any description can be written with the stylo provided, in block capitals or script, on the Halie Titling Foils or Masks and appears transparent on an opaque ground. Firms' names, signatures, drawings, lines and notes of any kind can thus easily be printed in on the borders of photographic prints and postcards in any desired style. In the same way complete sketches, silhouettes, etc. can be drawn on Halie Titling Foils and printed on photographic paper.



HALIE RETOUCHING OUTFIT

For glossy and matt prints, negatives and lantern slides. Complete range of tints.

Spots and pinholes will spoil the appearance of the finest picture. This new, inexpensive and adaptable Retouching Outfit enables not only the expert, but every amateur, easily to improve his negatives, prints and slides.

The most practical set ever put on the market.

A new and unique feature of this set is its Glossy Retouching Colours. Retouching done with these colours on glossy prints is not visible even when the print is examined against the light

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BOOKS ON PHOTOGRAPHY

The Book of the Miniature Camera. By George W. Hesse. Describes all types of miniature cameras and their use. **2/6**; postage **2d.**

Pictorial Photography with the Miniature Camera. By Edwin C. Buxbaum, A.R.P.S. Shows how the miniature camera can be used for pictorial photography. **2/6**; postage **2d.**

Colour Photography with the Miniature Camera. By Louis Marden. A new book giving the latest data available on colour photography. **2/6**; postage **2d.**

Portraiture with the Miniature Camera. By George W. Hesse. Tells how the miniature camera can be used successfully for portraiture. **2/6**; postage **2d.**

Travel Photography with the Miniature Camera. By Karl A. Barleben, Jun., F.R.P.S. A new book containing much information on selecting subjects for the miniature camera. **2/6**; postage **2d.**

Theory and Practice of Miniature Camera Photography. By Jack Kellman. Explains the "whys" and "wherefores" of such matters as film, exposure, filter factors, developing, etc. **4/-**; postage **2d.**

Getting Ahead in Photography. By H. Rossiter Snyder. Anyone who has the slightest leaning towards amateur photography cannot read this book without becoming more enthusiastic about the hobby. **4/-**; postage **2d.**

Candid Photography with the Miniature Camera. By Kip Ross. A well-known New York Press photographer tells how he obtains "personal" news pictures with a miniature camera. **4/-**; postage **2d.**

Composition Simplified. By Hermon Gabriel. A profusely illustrated handbook on the principles of composition. **4/-**; postage **2d.**

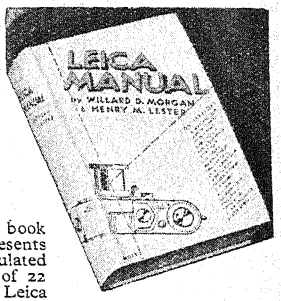
Correct Exposures with the Miniature Camera. By William Alexander. A new book which will appeal to users of cameras of all types. **4/-**; postage **2d.**

The Leica Data Book. By Karl A. Barleben, Jun., F.R.P.S. Gives in a handy form a vast amount of information about the use of the Leica camera. **5/-**; postage **2d.**

The Fine-Grain Negative. By Augustus Wolfman. A new book which contains all the latest available data on fine grain developing. **5/-**; postage **2d.**

"My First Ten Years with the Leica." By Dr. Paul Wolff. Illustrations with technical data. **21/-**; postage **9d.**

The Leica Amateur's Picture Book. By Rudolf Pestalozzi. Beautiful reproductions from Leica negatives with technical data. **21/-**; postage **9d.**



THE LEICA MANUAL

Here is a book which represents the accumulated experiences of 22 specialists in Leica photography. No other book has ever attempted to cover the broad scope of miniature photography as thoroughly as the Leica Manual. 500 pages, 350 illustrations. **Price 21/-** Postage in U.K. **6d.**; foreign postage **1/-**

PHOTOGRAPHIC ANNUALS

Photograms of the Year, 1936. Selections from the best international pictorial photography of the year. Nearly 100 art plates. Paper **5/-**; cloth **7/6**; postage **6d.**

Modern Photography, 1936. This volume, with over 120 large illustrations, includes recent examples of photography in Great Britain, U.S.A. and the Continent. Paper **5/-**; cloth **7/6**; postage **6d.**

The American Annual of Photography, 1937. A review of the year's work in photography. Fully illustrated. Paper **8/6**; cloth **12/6**; postage **6d.**

Das Deutsche Lichtbild, 1937. Contains reproductions of the work of the leading German photographers, together with English translation of the text. Cloth **25/-**; postage **9d.**

La Photographie, 1937. This magnificent publication contains over 100 superbly reproduced masterpieces of camera art by photographers of international repute. **12/6**; postage **9d.**

"Photography" Year Book, 1936-1937. A new annual dealing especially with photography as used in advertising. 464 pages, over 1,000 illustrations, 100 full page. **21/-**; postage **9d.**

U.S. Camera, 1936. A new book, representative of the year's work of the leading American photographers. 192 pages, 350 illustrations, with technical details. **15/-**; postage **9d.**

Leica Photographic Annual, 1937. A new publication. 160 illustrations, contributed by outstanding Leica workers throughout the world. 180 pages, with technical data. **17/6**; postage **9d.**

New catalogue of 200 Books on Photography FREE. *The postages quoted are for Great Britain only.*

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Optochrom

LIGHT FILTERS OF HIGH PRECISION

OPTOCHROM, G.m.b.H., AUGSBURG, GERMANY

"Optochrom" Light Filters are made of optical glass coloured throughout its entire mass during manufacture. They are not, therefore, affected by heat or damp as are gelatine filters mounted between glass.

Optochrom Yellow Filters. Unsurpassed for orthochromatic material.
Density No. 0 (extra light). Exposure factor about 1½ times.
Density No. 1 (light). Exposure factor about 2 times.
Density No. 2 (medium). Exposure factor about 3 times.
Density No. 3 (deep). Exposure factor about 4 times.

Optochrom Universal Green Filters. (A new introduction.) For use with either orthochromatic or panchromatic material.
Density No. 1 (light). Exposure factor about 2 times.
Density No. 2 (medium). Exposure factor about 3 times.

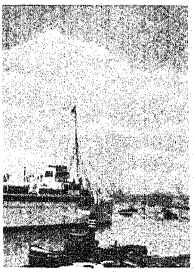
Optochrom U.V. Filter. A special filter for mountain subjects in conjunction with orthochromatic and panchromatic material; there is no appreciable increase in exposure.

Optochrom Reform Filter. A graduated filter of circular shape and steeply graduated from clear glass to deep yellow. Exposure the same as without a filter.

Optochrom Blue Filter. For correct colour rendering when using panchromatic material by artificial light. Exposure factor about 1½ times.

Optochrom Red Filter. For distant views and exposures in misty weather. With panchromatic material the exposure factor is about 6-10 times.

Optochrom Light Filters are supplied in metal mounts to fit lenses of all the most popular cameras, also in spring adjustable mounts.



With Optochrom Filter



Without a Filter



OPTOCHROM FILTERS IN SETS

Optochrom Filters are supplied in sets of 3 filters in case to fit Leica, Rolleiflex and Contax lenses.

Set A, containing Optochrom Yellow Filters Nos. 1 and 2 and Optochrom U.V. Filter.

Set B, containing Optochrom Universal Green Filters Nos. 1 and 2 and Optochrom Blue Filter.



OPTOCHROM FILTERS IN CHROMIUM FINISHED MOUNTS

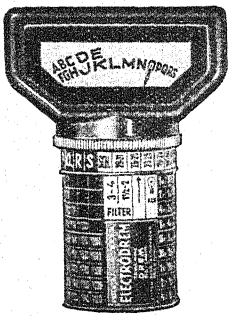
Optochrom Filters are also supplied in chromium finished mounts, 36 mm. to 42 mm. diameter, singly or in sets of three filters suitable for use on the chromium-finished Leica or Contax cameras.

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Electrodrem



THREE NEW AND EXCLUSIVE Features ! Not to be found in any other ELECTRIC EXPOSURE METER

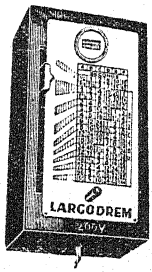
1 Range of daylight exposures 1/1000th second to 8 minutes.

2 Will indicate the correct exposure by artificial light for Panchromatic material.

3 Gives a direct reading when a filter is used without making calculations.

MODEL I for "still" photography.
MODEL II for "cine" photography.

THE "LARGODREM" Electric Exposure Meter for Bromide Enlarging



A new Electric Exposure Meter which indicates the correct exposure for bromide enlargements.

The "Largodrem" is simply laid on the baseboard of the enlarger, the light switched on, when the correct exposure for any make of bromide paper can be read on the scale.

The "Largodrem" is supplied complete with Paper Tester.

When ordering please state the voltage of the electric current where the "Largodrem" will be used.



THE "JUSTODREM"

The "Justodrem" Exposure Meter is of the extinction type; gives a direct reading when set according to the speed of the film or plate to be used. Only one adjustment necessary. No calculation to be made.

All that is necessary is to look through the "Justodrem," note the indicated value of the light and then read the correct exposure on the outside of the instrument. The letters employed for the measurement of the light are not arranged alphabetically but in an arbitrary order, so that there is no confusion with the succeeding letter and no risk of guesswork.

The "Justodrem" embodies other technical advantages, among which, one of the most valuable, is the entire absence of any adjustment during and after the observation.

Obtainable from Photographic Dealers everywhere

DREM - ZENTRALE

ROTENTURMSTRASSE, 27 VIENNA, I.

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THE BRITISH JOURNAL
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AND

Photographer's Daily Companion

WITH WHICH IS INCORPORATED

THE YEAR BOOK OF PHOTOGRAPHY AND AMATEURS' GUIDE AND THE PHOTOGRAPHIC ANNUAL.

1937

EDITED BY

ARTHUR J. DALLADAY, A.Inst.P.

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The present Almanac first appeared in the form of a wall calendar for the year 1860, and was issued as a supplement to the "British Journal of Photography" of Dec. 15, 1859.

The Almanacs for the years 1861-65 were 4 x 2½ inches in size, and were issued gratuitously to subscribers to the "British Journal of Photography."

The present crown 8vo format was adopted for the 1866 issue, which was the first to be sold exclusively as a separate publication.

Successive editors of the Almanac :—

1861-2	Samuel Highley.
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SOLVING THE ABNORMAL EXPOSURE PROBLEM

BY THE EDITOR.

At the present time, it can hardly be questioned that the most useful and practical meter for all-round purposes is the photo-electric type, now made in a variety of shapes and sizes, some better than others, but all of them quite sound little instruments with similar characteristics, similar advantages, and similar limitations. In the best instruments, the limitations of the type have been recognised and as far as possible countered by careful design and the closest possible regard for the requirements of the practical user.

It has been pointed out time and again that the utmost benefit from this careful design can only be reaped by equal care and thought and precaution on the part of the user, and the considerations governing the efficient use of such a meter have been set out in an extremely practical form by P. K. Turner (B.J., 1936, April 17, pp. 239-241) in an article in which every basic type of meter is reviewed and classified and excellent advice given for the best use of the photo-electric meter and others having fundamentally similar characteristics.

I, personally, have used a meter of this type with every satisfaction for a wide range of subjects, and for handiness and reliability nothing could touch it. Nevertheless, those who take a fierce kind of joy in vanquishing the toughest of exposure problems, and who, be it whispered, are even capable of manufacturing ugly looking problems for the pleasure of overcoming them, will never be satisfied with anything less than the perfect meter.

Let it be said at once that this ideal meter, like, shall we say, the ideal miniature camera, is not yet made, is not likely to be made to-morrow, and when it is made will be both expensive and—again like the miniature camera—will require care and intelligence in its use.

Many years ago, before the photo-electric meter was put on the market, it occurred to me, as no doubt to many others, that the only sound exposure meter would be one that would measure, from the position of the camera, and in absolute units independent of eye fatigue or dark accommodation, the luminosity of the shadows of the subject. The only means available at that

time of achieving this object was the use of some photometric device which would allow of visual comparison of the brightness of an image of the subject with a standard intensity. Such an instrument was rigged up, and gave excellent service for the purpose for which it was required—indoor work—but was extremely bulky, the measuring instrument consisting of an electrical millivoltmeter testing set twice the size of this volume and connected to the photometer by an awkward lead. Recently I have been led, by a need to take the instrument farther afield, to develop it into one of handier shape and wider scope, with some interesting results that it is the purpose of this article to describe.

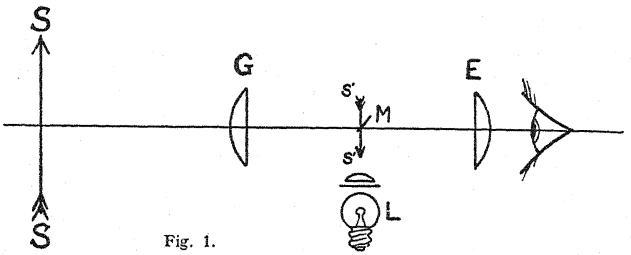


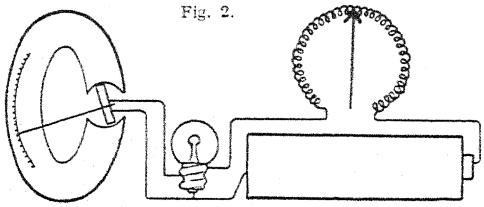
Fig. 1.

As at present constructed, the instrument is but half developed, but it has served effectively for the accumulation of data such as would be necessary for the design of a more elaborate meter capable of solving any exposure problem that might be set. It will probably be said, and with truth, that a great deal of what follows has been known, and even applied, for years. On some of the devices utilised, patents already exist. The welding of the whole into one instrument is, however, I think of some interest, and its description may moreover help to clarify the popular conception of some of the problems involved in the systematic control of exposure by scientific means.

The principle of the instrument is that of a simple photometer combined with a telescope, and is shown diagrammatically in Fig. 1. The object glass G forms an image of the subject S - S at S′ - S′ which is viewed through the eye lens E. M is a 45° mirror in the form of a small triangle with the point downwards and in the plane of the image of the subject. It is illuminated by the lamp L and condenser, and appears as a more or less bright patch superimposed on the subject; and by varying the brightness of L it may be made to match up with its immediate surroundings. (If the combined image is sufficiently dimmed by the interposition of neutral density

filters, differences of tint do not seriously interfere with matching.) If, then, the brightness of L is known, the brightness of any point of the subject—and therefore the exposure required—can be determined.

Fig. 2.



The first point of divergence from existing designs lies in the method of measuring the brightness of L. A variable resistance is, as usual, employed to *vary* the brightness, but the value of the resistance is not used as a basis of measurement, since this assumes constancy of the battery voltage or else necessitates continual re-calibration. Instead, the modern practice of utilising a moving-coil galvanometer, as in the photo-electric meter, is followed, and this has further advantages, as will be mentioned later on. The electrical circuit can be seen from Fig. 2. The flashlamp battery, which costs threepence and

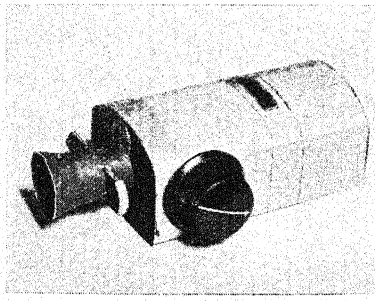


Fig. 3.

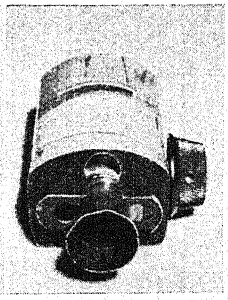


Fig. 4.

lasts a long time, and can be instantly replaced, supplies the current to the lamp, which consumes only 0·06 amp., through the variable resistance. The lamp is shunted by the voltmeter, from the pointer of which the brightness is read off on a suitably calibrated scale, without possibility of error due to running down of the battery, which would merely have the effect of limiting the upper range of the meter. For convenience,

the magnet of the voltmeter surrounds the telescope, and an almost imperceptible movement of the eye suffices to pass from subject to scale, which, incidentally, can be illuminated from the same, or a twin, battery. In the simple instrument described, the scale is illuminated by general light through the window seen at the top of the casing.

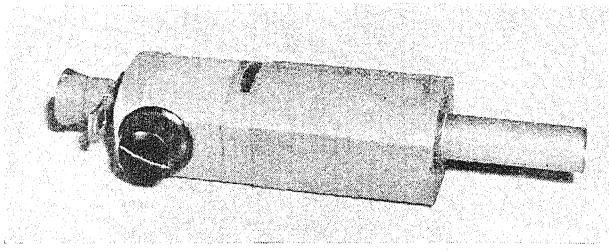


Fig. 5.

So much for the principle of the meter. Figs. 3, 4 and 5 are photographs showing its outward appearance, and despite being made from standard accessories not designed for the purpose it is, as can be seen, by no means bulky, and has indeed served for quite a lot of experimental work. In practice, it could be made much smaller, neater and better. Figs. 6 and 7

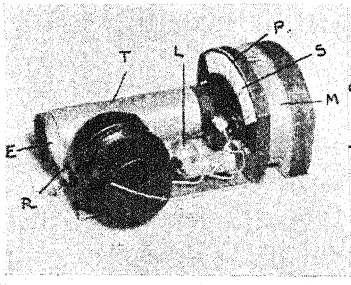


Fig. 6.

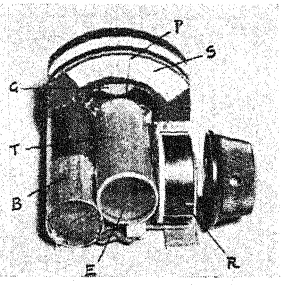


Fig. 7.

show the cover removed, and the arrangement of the parts. The magnet M of the voltmeter is sandwiched between two wood blocks which form the support both for the metal framework on which the instrument is built and for the cover which encloses it. On the front block is fixed the scale S over which moves the pointer P. R is the variable resistance the knob of which remains outside the casing, T the telescope tube with

eye lens E, and object glass G separately mounted the other side of the magnet. The battery is housed in the tube B. The lighted filament of the lamp L can be seen just above the small series resistance of 600 ohms that adjusts the maximum scale reading to something over 2 volts.

The range of the instrument for direct reading on the shadows (or on the highlights) is from 0·001 to 4 foot-lamberts or equivalent foot-candles (e.f.c.), while swing-in neutral density filters of 1·0 and multiples of 2·0 density give multiplying factors enabling readings to be taken up to 1,000 million e.f.c. The full range is thus from the threshold of human vision to several times the intrinsic intensity of the sun —in absolute units. The most accurate measurements are made at low intensity, and it is the purpose of the neutral density *eyepiece* filters—also of 1·0 and 2·0 density—to reduce the luminosity of the subject and comparison field simultaneously to a convenient level for accurate measurement. In order that the readings, which are in visual luminosities, may represent effective photographic intensities, a visual filter (Ilford P.V. filter) may be attached, permanently if desired, though this noticeably reduces the ultimate sensitivity, in front of the objective; its use, for ordinary purposes, is unnecessary. When in use, it may be employed in conjunction with any filter—green, yellow, red or contrast—that is to be placed on the camera lens, and will enable the correct exposure to be determined when that filter is employed. A prominent zoological photographer recently remarked that even the best of exposure meters would not tell him what exposure to give to a red macaw on non-ortho material. Whilst such a need is hardly likely to arise every day, this type of meter will, given a suitable visual filter for ordinary material, actually indicate the exposure for such exceptional cases. And what is more, should an enthusiastic experimenter further to complicate matters go one better and place a green filter in front of his lens the meter will still indicate the necessary—somewhat protracted—exposure, unless it is in the region of a good many hours: I do not know how monochromatic in tint is the plumage of the said macaw.

As regards the ultimate sensitivity of the instrument, it stands to reason that with any visual meter no indication can be obtained unless the object can be seen with the unaided eye, nor is any greater sensitivity than this needed apart from the use of infra-red and ultra-violet radiation. The practical limit of visibility in my own case appears to be about half a thousandth of an equivalent foot-candle unless a considerable time is first spent in almost total darkness. This corresponds to an

exposure of some 8 minutes at $f/8$ using super-speed material. There are, however, two makeshift methods of increasing the effective sensitivity. One is to make a guess at the maximum tone range likely to exist and to expose either for a natural highlight or to make the measurement on a piece of white paper and to give an exposure which will place this at a safe distance

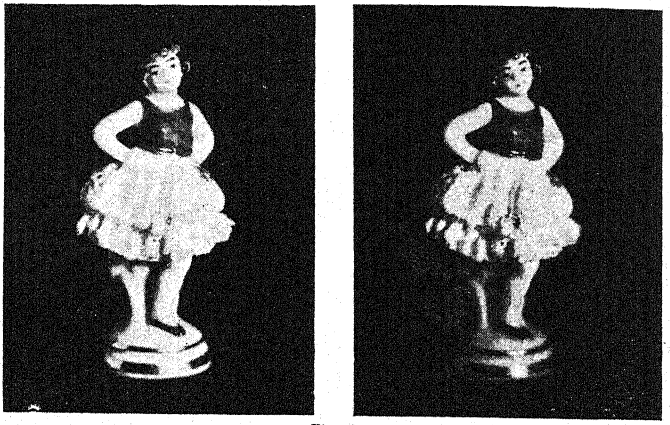


Fig. 8.

above the toe of the characteristic curve or as nearly so as the time will allow. (See *d* below.) The other method is directly applicable only to an integrating meter such as the usual photo-electric type—and then only if it has an angle of view greater than is desirable for its legitimate purpose. To a direct visual photometer of this type it can be applied only if some wide-angle diffusing device is incorporated which will receive its illumination as effectively from all of, maybe, a number of widely scattered light sources as does the actual subject. Occasion for such sensitivity rarely arises, for it would mean exposures of prohibitive length, and I have not investigated the application of the method to this type of meter. There is, however, no reason why it should not be incorporated.

Fig. 8 illustrates the former method. The doll in the left-hand picture was lighted by a single lamp, and the respective brightnesses of highlights and shadows were measured as 0·05 and 0·001 e.f.c. An exposure of 5 minutes at $f/8$, as was intended, just shows up the dark hair against the slightly lighter background, the threshold response of this material being represented by a subject luminosity of 0·05 e.f.c. seconds

at *f*/3·5. This shadow illumination was deliberately chosen as the minimum that could be directly measured. In the right-hand illustration, the illumination had been reduced far below the limit of actual visibility of shadow detail, so that the high lights, previously measured as 0·05, on measurement now showed only 0·002 e.f.c. In practice, for safety, these high-lights should then be placed so high up on the characteristic curve as to ensure that the shadows will receive adequate exposure : in the present case, where the tone range is known to be 50 : 1 for the features of interest, this exposure would be at least 2 hours at *f*/8. If the tone range had not been known it might, for safety, be anything up to the limit of latitude of the material—in this case 50 e.f.c. seconds of subject luminosity—i.e. some 7 hours at *f*/3·5 or over a day at *f*/8. I gave it the minimum of half-an-hour at *f*/3·5, with the result that it is slightly under-exposed, presumably as a result of the operation of the Schwarzschild effect, as compared with the first exposure, but still just barely shows the dark hair. The contrast, as is to be expected, is rather lower, through working further into the under-exposure region. This, then, may be taken as approaching the ultimate limit of sensitivity of visual measurement of exposure, apart from the second method of observing the light source itself, which, of course, would greatly extend it, but at the expense of some complication and uncertainty.

Before proceeding to outline directions in which improvements might be made, I will give a few examples of the uses to which the instrument as it stands has been put.

(*a*) *Exposure for the shadows.* The meter is set on the shadows and the exposure read direct. This guarantees a definite predetermined density for the lightest parts of the negative. In practice this has been found to work out with surprising accuracy with panchromatic material by daylight and artificial light with the most diverse subjects and luminosities.

(*b*) *Exposure for the highlights.* The same applies, but in this case the setting is made on the highlights and a maximum density is thereby fixed for the dense parts of the negative.

(*c*) *A specified density* can be fixed for any chosen point of the subject. Fig. 9 is an interesting example which also demonstrates the range of the instrument. A is a photograph of the Sun, B of the Moon and C of a step wedge, all taken on the same strip of super-speed pan film and developed together. They were taken with a 6 × 6 cm. camera and short focus lens and the developer was not chosen for its fine-grain qualities ; hence the excessive grain. The exposures were calculated in

accordance with the meter readings with the object of obtaining approximately equal densities on the negative for the Sun and Moon (see below). The Sun's intrinsic intensity was measured as 150 million, and the average intensity of the Moon as 50 e.f.c. —a ratio of 3 million to one. (It is interesting to note that this is a somewhat higher ratio than that usually given for the relative *illuminating* powers of Sun and Moon.) To obtain the requisite short exposure in the case of the Sun, neutral density filters had to be interposed in front of the camera lens. Comparison of the results, which are naturally liable to errors arising from shutter efficiency and other causes of a more or less minor character, and which the scope of the experiment did not justify investigating, show that the dark areas of the Moon are, on the print, actually not more than 50 per cent. lighter than the Sun's image, whilst the light areas are perhaps 6 times as light. For the purpose of the comparison, all three were, of course, printed simultaneously and developed together. As to absolute exposure, the exposures given were calculated to be about 15x and 20x the threshold values, for the Sun and Moon respectively, which should just show an image on the material used. The actual image, as revealed by comparison with the step wedge, showed that about twice this exposure was actually received by the film in the case of the Sun : not a bad agreement in view of the extremely small size of its image and the fact that no previous test had ever been made with the object of checking the operation of the instrument over so extreme a range. The value of this facility when the photography of any technical subject, including actual light sources, is involved will be at once apparent.

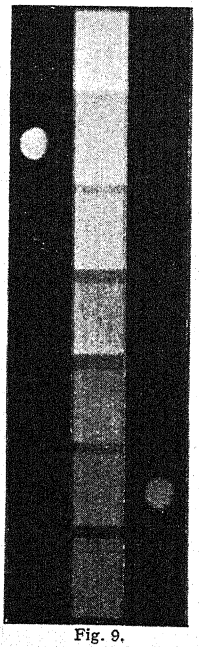


Fig. 9.

(*d*) *Placing an exposure exactly in a specified section of a characteristic curve.* This is necessary :

(1) when the contrast ratio approaches or exceeds the latitude of the film. Fig. 10 is an instance. It is a photograph of a candle and candle-stick without any other illumination than that provided by the candle flame. The measured brightnesses of the various points were : flame 1,500 ; handle of candle-stick 0·8 ; base of candle 0·04 ; and

shadow of socket 0·025 e.f.c. An exposure was given of one second at $f/3·5$. This was designed just to render the gradation at the bottom of the candle. All deeper shadow is, of course, lost. Even so, as the darker print from the same negative, inset on the left, reveals, the candle flame has entered the solarisation phase and appears no brighter than the candle. An exposure of 1/25 sec., which according to calculation should place the flame nearly at the top of the straight portion of the curve, reveals the gradations of the flame and candle in their true relation (inset right) and would be the correct exposure if the flame itself were the object of interest. Obviously, this is a subject completely outside the range of the material ; a double-coated ' chrome ' film would, with its wide latitude, have gone a long way towards covering the range.

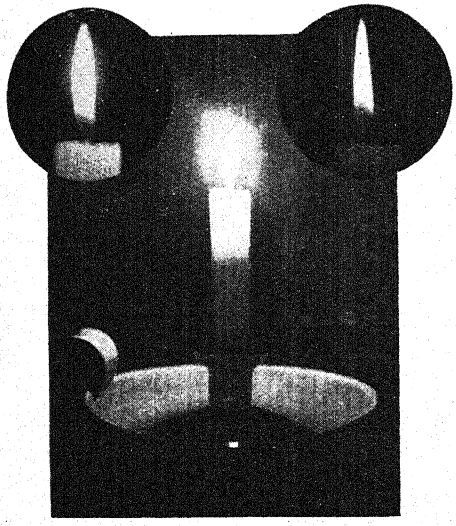


Fig. 10.

(2) When using portrait material and working on the toe of the curve, any variation of exposure will seriously affect the contrast of the negative. The correct placing of the tone range on the curve will ensure correct contrast when working under standardised conditions such as can be maintained in studio portraiture.

(3) Using the controlled illumination and gamma-infinity development method recommended by Mortensen [1], where both exposure and tone range must be accurate to within exceedingly close limits, such a means of control is the only alternative to the hit-or-miss methods regarded even by Mortensen himself as in a measure inevitable, with consequent waste of material and loss of opportunities.

(*e*) *Investigation of tone ranges.* Wide speculation has been rife as to what are the real tone ranges met with in practice.

quite apart from the utility or possibility of reproducing them. Thus, estimates of maximum tone ranges vary from 250 : 1 to 100,000 : 1 (2). With this photometer I have measured daylight tone ranges up to 400,000 : 1, and I have little doubt that similarly high figures are easily found under outdoor artificial lighting conditions. Fig. 11 is a poor specimen of a photograph of an even poorer subject, but it probably has more interesting parallels among archæological subjects, and since it illustrates an extreme tone range is included here. The subject is a tunnel, only a few yards long, on a path leading from the Downs to the main road near St. Catherine's lighthouse. The walls showed, very conveniently, the minimum measurable luminosity of about 0·001 e.f.c., the distant sky, 400 and the distant meadows 50 e.f.c. In the resulting photograph, which was given an exposure of 2 minutes at $f/3{\cdot}5$ in order to render the detail of the tunnel walls, the distant view has hopelessly solarised, although as will be seen from the characteristic curve, Fig. 12, actual reversal does not even begin to set in until 10,000 times the threshold exposure has been given, and there is in any case no very marked reversal, owing to successive solarisation maxima, (3) even with at least 1,000 times more exposure than this. The tunnel walls, however, give a normal print (out of focus through the necessity for using open aperture) with detail just visible in the shadows, showing that the estimated luminosity was about correct, whilst obviously, apart from the actual measure-

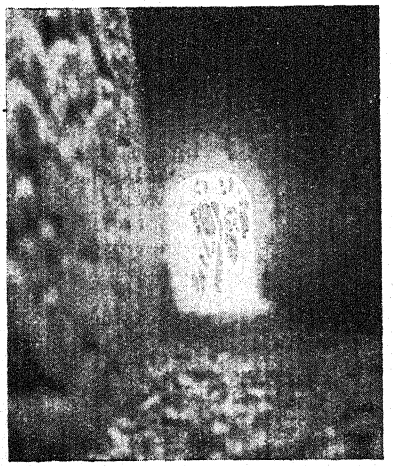
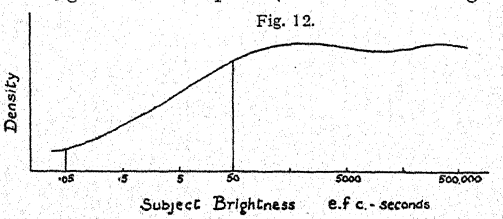


Fig. 11.

Fig. 12.



ments quoted above, the correct exposure for the distant view must necessarily have been in the neighbourhood of 1/100 sec. Assuming a tone range for the distant view of 30 : 1, this gives a total tone range of $120 \times 100 \times 30 = 360{,}000$.

As to possible developments. The most important of these is probably the inclusion of a photo-cell of the ordinary type reading on the same voltmeter—with of course the necessary electrical adjustments— as an alternative to the visual measurement. This would in the first place serve as a rapid integrating meter of wide or narrow (variable) angle of view for ordinary work, and for not very exacting colour work in particular where fairly accurate results are obtained by average measurements and more thought would be needed for the more intricate, but at the same time more sound, independent luminosity measurements. The photo-cell addition would, however, put a valuable tool in the hands of the scientific worker inasmuch as it would enable him to fix the lower luminosity level with reference to the equivalent background brightness (5) Thus, if he were developing individual negatives in such a way as to fit the measured contrast of the subject to the paper range (4), it would tell him how dark were his deepest greys in the subject relative to the background brightness; and because the 'maximum black' of visual perception—i.e. the minimum intensity which can be perceived by the eye and should therefore be represented on the print by a perfectly black deposit—bears a definite ratio (5) to the background brightness, this relation between the photo-cell reading, which measures strictly the background brightness, and the visual shadow reading will be a direct measure of the apparent 'blackness' of the shadows. Hence it would provide the factor by which his development must be curtailed in order to enable him to stop short, when printing, at that degree of blackness whilst retaining detail in the highlights, assuming, as is usually the case in my opinion although authorities differ on the point(6), that the highlights are to be rendered as practically white paper. Without such a control, his pictures, especially short contrast ones of high key, would, if printed on his standard grade of paper, lose their special characteristics and completely fill the paper range unless development was interfered with by mere guesswork—or shall we say experience. Obviously, the system will perform a similar function in fixing the highlight level of low-key pictures, and the effective visual scale of short-scale middle-key pictures. I do not think, however, that any corresponding data exist which determine at what level above the background brightness 'white' ceases to be white and becomes 'grey.' This is more psychological than physico-physiological in its nature.

Another improvement would of course be the transference of the pointer indications to the outside of the meter, where they would form the starting point of an exposure calculator that would take account in the usual way of stops, speed of materials, etc. Such a refinement would be essential in the combined visual and photo-cell meter on account of the different calibration curves of the voltmeter for the two purposes. Separate, adjustable reference marks could be given for highlight and shadow readings to suit the material, whose characteristic curve must, for any accurate work, be known for the developer and printing conditions that have been standardised.

Quite a number of refinements might be added which if properly designed would add to convenience and utility without making for undue complication. Nevertheless, as was indicated at the outset, a meter such as this is a precision instrument, and as such must be somewhat complicated to use. But to those who would say that all this fuss about theoretically accurate determination of exposures which do not happen in practice, and which an experienced photographer could cope with anyhow, does not get us anywhere, I would answer that photography is full of approximations that are ' near enough,' and the more we can reduce to exact measurement, the more we realise the inner meaning of quite a lot of things that we had taken for granted or never even thought about, and quite apart from the direct utility of the methods described I can recommend the problems of exposure as a plaything that will occupy quite as many idle hours as the average photographer is likely to have at his disposal.

(1) Pictorial Lighting, William Mortensen.
(2) Modern Tendencies and the Tone Range. B.J., June 5, 1936, p. 350.
(3) Successive Maxima in Solarisation. H. Borst, " Die Photographische Industrie " XXXIII, 48, Nov. 27, 1935, pp. 1057-8 ; abstracted B.J., 1936, Jan. 3, p. 10.
(4) Subject Contrast and Gradation, A. J. Dalladay, B. J. Almanac, 1936, pp. 143-151.
(5) The Photographic Representation of Street Lighting Installations. R. G. Hopkinson. Trans. Illum. Eng. Soc. Vol. 1, No. 2, Feb. 1936.
(6) Print Exposure and Paper Speed. J. Southworth, B.J., 1936, October 9, pp. 641-3.

THE MOUNTING, FRAMING AND DISPLAY OF PHOTOGRAPHS

By REG. W. FORD.

Under this heading I propose to deal with an aspect of picture-making which, while of secondary importance to the more discussed necessities of good composition and technique nevertheless can very considerably add to or detract from the value of photographs as pictures or records. The subject conveniently divides itself into two parts—the first with reference to photographs intended for decoration or exhibition, the second showing how to make the most of the popular, but sometimes despised, album method of display.

MOUNTING AND FRAMING FOR DECORATION.

The light, airy rooms of modern houses demand light and airy pictures to adorn them. The trend of a person's taste is indicated not only by his choice of pictures but by how he displays them. Large oil paintings with their vast expanses of canvas and gold leaf find little place in the homes of to-day since they require a setting proportionate to their size. However much we may deplore this state of affairs we must accept it. But with the disappearance of the oil painting the photograph is coming into its own. Clean washed walls are its proper setting, as oak panelling was that of the family heirlooms. But while the preservation and display of the latter was a task for the expert, the finishing and furnishing of the photograph can be done by the artist himself. Because it is so simple however that is no reason why we should not give just as much thought, in proportion, to the job. While many a "border-line" composition can be turned into a good picture by skilful mount-cutting and framing, it is equally certain that an attractive composition can be ruined by bad workmanship in these final stages.

There are two principal methods of mounting. The simplest is the ordinary flat mount, which is nothing more than a print stuck straight on to a piece of card with a suitable surface. To secure adhesion the worker will use whichever method he is most familiar with—dry mounting tissue, liquid glue, paste,

etc. So rather than spend time discussing any of these processes let us pass on to the actual placing of the print relative to the mount. This is assuming that the mount is to be larger than the print, to show a margin all round it. The print must first be trimmed to size. To enable yourself the better to judge the composition before taking the irrevocable step of cutting, make two right-angled masks of thin white card as shown in Fig. 1. Lay them on the print and move them about until you think you have made the most satisfactory composition from it. You will probably be surprised at the revelation of unsuspected interest opened up, and you may be hard put to it to decide which is the best portion of the

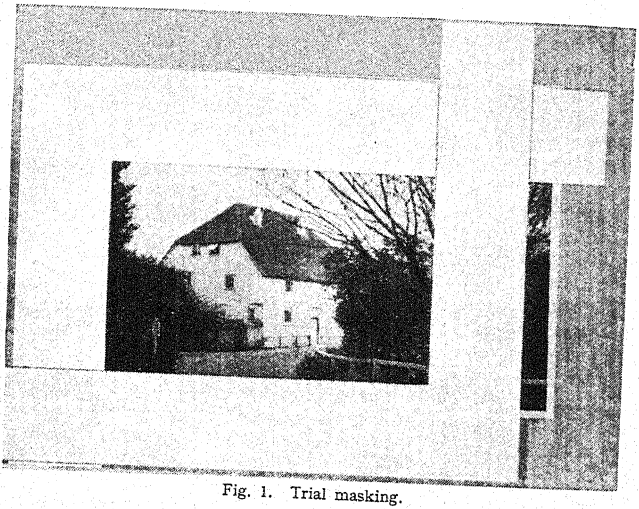


Fig. 1. Trial masking.

print to preserve. I am afraid I cannot help you there; but when you have arrived at a decision, lightly mark where the four corners of the dummy masks rest, and square the print up to these. If you possess a guillotine or a drawing-board and T-square there will be no difficulty in doing this; but if you have not these facilities the square-cut corners of a page torn from a magazine can be used as an improvised set-square. However you arrive at it, the squareness of the corners of the print must be absolutely correct, since nothing looks worse in any part of a frame or mount than a vertical or horizontal slightly out of truth. It is astonishing how trifling an

error the eye can detect when a picture is viewed against a wall, even if it cannot be estimated. Trim the print with either a very sharp knife or a safety-razor blade held against a stiff steel rule. As the tendency of the straight-edge is to slide away from the blade—that is, towards the body of the operator—if possible hold the rule on the margin to be cut off so that any slip will take effect on the waste and not on the actual print. If the waste is too narrow to allow this, hold the rule extra carefully, with thumb and fingers extended upon it in a directly vertical pressure. Cut through on to a sheet of plate glass to get a really clean edge. Keep whatever instrument you use to a razor sharpness so that no more than one stroke per cut is required.

Lay the print on the selected piece of mounting board, and, guided by your eye alone, faintly pencil in adequate margins. Allow a deeper margin beneath the print than above it, or else when hung it will look as if it is forever just going to slip out of the bottom of the frame. (Specify this if you have your mounting done professionally, as some mounters will give you equal margins in the absence of definite instructions to the contrary.) Top and side margins should be about equal. Trim the mounting board to size, and then stick the print in the predetermined position.

The second type referred to is the cut mount. This requires a little more skill and care to make, but it is by far the most effective—not only in appearance, but also in preserving the picture. The danger with a print mounted flat and pressed by the backing board against the glass of the frame is from condensation on the inner surface of the glass, which, as it causes the two surfaces to stick, is of course ruinous.

Arrange the composition in the same way as described above, but do not remove the margins. Mount the print flat on a sheet of cheaper quality card, and then mark out the top mount on a good board. Use that sold specially for the purpose, because this cuts smoothly and easily, which is half the battle. The actual opening should just reveal the print as intended, but in marking out add about $\frac{1}{8}$-in. all round to allow for the bevel. Lay a steel rule to the margin side of this line and cut at an angle of 45 degrees on to glass or zinc, using a very sharp, stiff-bladed knife. The stroke must be absolutely firm and steady and the ruler held with rock-like rigidity. Do not overrun the corners, but take the knife off at an angle to give a mitre to the contiguous side. Glue this top mount on to the flat section with the print and allow to dry out under pressure. Make sure that it adheres right up

to the edge on all four sides but without any adhesive squeezing out on to the print itself. When dry trim the outside edges of the two sections level and square all round.

It will be found most economical and convenient to lay out mounts to fit stock size frames, and to mount prints of approximately equal size on the same size mounts. The frames will then be interchangeable, which is very useful when one is wanted in a hurry. There is a vast range of stock size frames available, and the most exacting person will find his requirements met somewhere amongst it at half the cost of having frames specially made. The following list shows one supplier's assortment in a narrow half-round black moulding eminently suitable for photographs.

7 × 5 ins.	11 × 8 ins.	12 × 10 ins.
8 × 6	10 × 8	14 × 10
9 × 7	12 × 8	14 × 12
10 × 7	12 × 9	16 × 12
11 × 7	11 × 9	16 × 10
18 × 14 ins.	20 × 15 ins.	

The prices range from 6d. for the smallest size to 3s. 3d. for the largest.

As a guide to proportions the table below gives a few practical examples.

Size of Frame.	*Size of Picture.*	*Depth of Top Margin.*
14 × 12 ins.	$7\frac{1}{2} \times 6\frac{3}{4}$ ins.	$2\frac{1}{2}$ ins.
16 × 12	$7\frac{1}{4} \times 5\frac{3}{8}$	$3\frac{1}{4}$
$18\frac{3}{8} \times 14\frac{1}{2}$	$10\frac{3}{8} \times 7\frac{1}{2}$	$3\frac{1}{8}$
11 × $13\frac{3}{4}$	$5\frac{3}{4} \times 8\frac{1}{4}$	$2\frac{1}{8}$
12 × 14	$5\frac{1}{8} \times 7\frac{1}{2}$	$2\frac{1}{2}$

The first three are upright, the last two horizontal pictures.

FRAMING.

The choice of frames and tints of mounts is a matter of preference. For myself I think nothing compares with a pure white mount for a black and white print, with a $\frac{1}{4}$-in. flat matt frame. For toned prints an ivory or cream board is suitable with a frame that harmonises. In all cases the frame should be as narrow as possible and the area of mount unstinted. A white mount soils very quickly and when handled should be held by the pressure of the ball of the thumbs against the edges, the fingers being prepared to steady it at the back. Never pick up a white mount between thumb and fingers even when you think your hands are scrupulously clean, and when packing place face to face. Where photographs, such as are used for commercial purposes, have to be handled a great

deal, unframed grey or brown mounts are certainly advisable. But for decorative schemes I do not recommend them.

The mount can be finished with a system of light lines ruled around the print, say at about ¼-in. distant from the print on top and sides and ½-in. to ⅝-in. at the bottom. You can use either soft pencil, water-colour tint in a ruling pen, a wash line drawn with a small flat brush full of colour or lines simply indented with a bone point. The last should only be employed where the picture is to be hung in a good light. The wider space below the print provides room for titling—but do not attempt this unless you are confident of the steadiness of your hand and of your knowledge of lettering, since no alteration is possible, so delicate are mount surfaces. It is best for this to use water-colour in a fine brush with a good sable point or else a 2B pencil. The very faint guide lines can be removed in the former case with a soft rubber, but in the latter should be incised with a clean steel knife tip, so lightly that they are only visible close to when the light shines across them. If you are at all apprehensive however it is best to leave well alone.

When actually framing make certain that the inside of the glass is spotlessly clean and the mount free from specks. The best way to remove particles from a mount is, not to rub it, but to hold it at an angle and flick downwards with a clean fluffless cloth. Dust round the inside of the rabbet to get rid of all tiny fragments which as soon as you began tacking nails in would fall between mount and glass. Nothing is more aggravating than to be compelled to unseal a finished picture to remove bits and pieces which definitely were not there when you started. In stock frames the backs are usually secured by the old-fashioned headless nails. Replace these with small fretwork pins. They are much more suitable for light-weight frames if driven well home. Seal the back with strips of gummed paper stuck to the edge of the frame and the backing board. Pay special attention to the corners, where dust quickly tends to creep in, and if the tape is inclined to strip off, run a little glue along the wood of the frame.

When hanging the picture I prefer to use the hooks, obtainable from most art dealers, which render unnecessary the objectionable triangles of cord dependent from obtrusive hangers. These hooks are driven into the plaster at such an angle that it does not break away and they tighten their grip the heavier the weight upon them. Two are placed behind the picture and the cord goes over them in the usual way, but is invisible, and the picture hangs as it should do—a trifle above

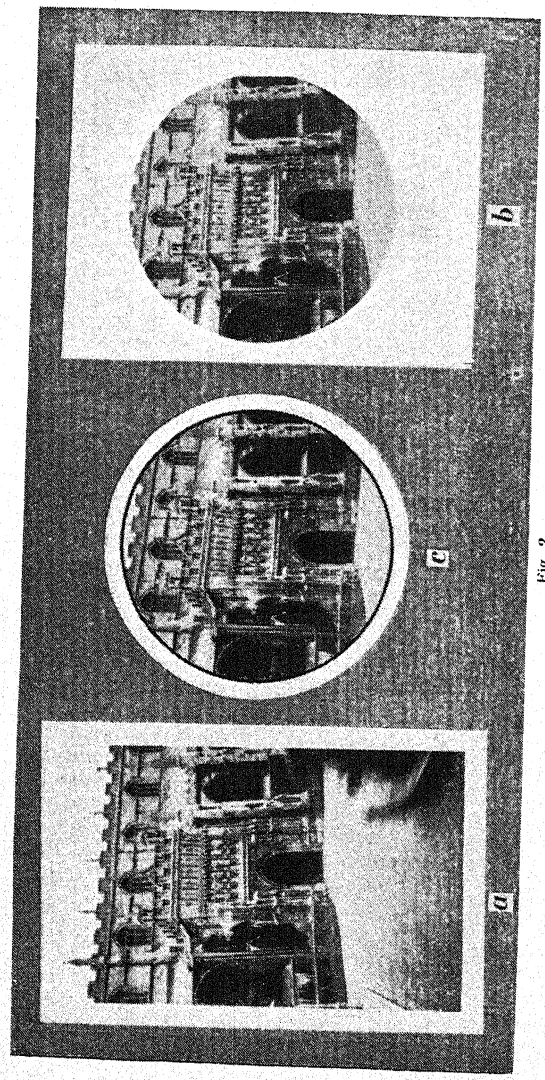


Fig. 2.

(*a*) Not good enough to enlarge, but don't throw it away. (*b* & *c*) Turn it into an interesting snap for the album.

eye level and nearly flat. If only one hook is used the picture easily sags from the horizontal.

The treatment of colour photographs depends on the subject, but narrow gold frames suit most. As an alternative to white mounts a good matt black can be very effective, throwing up the colours as in a Baxter print. Matt black paper is sold by artists' colourmen for showcard work, and should be mounted on the board previously to cutting the bevel. This surface too requires delicate handling as it is inclined to shine if hardly used. Titling may be executed in any suitable light colour, but the place should first be burnished smooth to lay the surface. Use a No. 3 sable brush, the point of which has been singed by passing quickly through a match flame.

Gilt mounts, once popular for water-colours, are apt to look garish if too ample, and so should be reserved for large pictures where they can be kept narrow. Very large photographs of all kinds may be framed with no margins. In such cases the frame should contrast with the print. For instance, a silver frame would look better than a matt black for a dark subject.

Snap-shot Albums.

We have not room on our walls for all our pictures, nor indeed do we wish to enlarge every one—although it is good to have a portfolio from which our frames can be replenished when we desire a change. Yet it is pleasant to keep the humble snap-shot, and there is really no reason why perusing the album should not be a source of entertainment for our friends instead of a boring social duty. First, a word about the snaps themselves. Here are some suggestions. Mask the negatives with as great care as you would bestow on more important efforts and print on a matt bromide paper. Either scrape a thin line on the negative or rule a narrow border in indian ink exactly on the edge of the print. (Fig. 2c). Trim to leave a white margin $\frac{1}{8}$-in. on the top and sides and $\frac{3}{16}$-in. at the bottom.

A rather pleasing effect is given by dyeing the card or paper base a suitable tint—rose for a sunset, green for a landscape, yellow for a summer scene, etc.—while retaining the white margin. To do this mask off the margins with narrow strips of stout gummed paper and then immerse the print in a dye bath. I use solutions of methylene (blue), thioflavine (yellow) and rhodamine (red) for the three primary colours and obtain other tints by mixing. Only weak solutions are required. Allow the print to soak for not more than a few seconds or

the gummed tape will float away. Drain and dry. While still slightly damp, but when the dye is too ingrained to run, strip off the masking strips and dry thoroughly. In this way a clear white margin is preserved. If the dye is too intense wash the print in clean water. If too pale, another immersion will deepen the tint.

As to mounting—although a loose-leaf album will serve, I like to make my own from the sheets of stiff mounting or pastel paper sold by artists' suppliers at 3d. or 4d. each. These can be bought in all shades and surfaces of black, brown and grey and usually measure about 30 × 20-ins. For snaps up to $3\frac{1}{4} \times 2\frac{1}{4}$ ins. cut the sheet into pieces $7\frac{1}{2} \times 10$-ins., i.e., divide into four divisions on the long side and two on the short. Punch two holes with a file punch at the left-hand edge and mount prints one on a page, nearer to the top than the bottom but centred sideways. If possible dispense with visible adhesive corners in favour of tissues, invisible corners or glue. Title the prints with chinese white (Artist's quality), rule a line round the whole, and make a note of any details in the bottom right-hand corner. Fig. 3 shows a suggested page lay-out. Add two stiff cards for covers and bind together with ribbons through the punch holes. Here is an album which is always complete, to which you can add indefinitely, and from which a particular print can be abstracted without trouble. And the single picture per page does not compete nor invite comparison with its neighbours. It is suggested that prints might be filed in a series of uniform albums according to subject or interest. I have one devoted to the old buildings of my native town, another to Devon and Somerset scenery resulting from a holiday tour, a third to personal subjects. So you can select to show your friends whatever interests them, and thus earn a reputation as a good photographer and a good host at the same time.

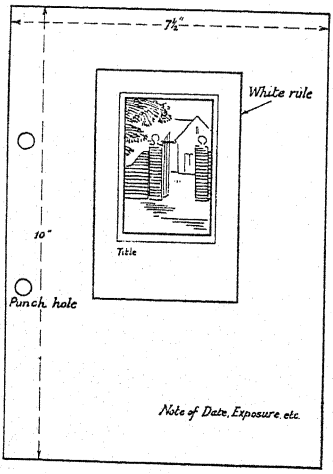


Fig. 3. Layout for album page.

THE HYPERFOCAL DISTANCE AND HOW TO USE IT

By Rev. B. Wright, M.A.

Gone are the days when we used to carry a half-plate camera on our photographic expeditions, and gone too are the focussing screen and the cloth ; we no longer focus on the principal object and stop down until everything is sufficiently sharp. Yet correct focussing is as important as ever it was ; it is a cardinal error to suppose that focus is a matter of little importance with a miniature ; the idea that the miniature is fool-proof and has unlimited depth of focus is responsible for many of these expensive instruments coming on the second-hand market " new last week " or " only used one film." The miniaturist must have several special accomplishments, not least of which is the art of focussing by theory.

If a camera is focussed for true infinity, the image of a point at an infinite distance will form a point on the sensitive surface ; (as we are dealing here only with out-of-focus effects we assume the lens to be perfect in other respects). When the point approaches the camera to a distance H from the lens, its image will be formed in the substance of the plate, on the side of the sensitive film away from the lens, therefore the cone of rays proceding from the lens to form the image is cut by the sensitive surface in a circular disc, the disc of confusion, geometry giving the relation $H = \frac{f^2}{s\,c}$ (1) f being the focal length of lens, s the stop number, and c the diameter of the disc of confusion. If we make c the largest permissible disc that can be tolerated without seeming to be out of focus, H will be the hyperfocal distance. To fix a value for c we have to choose a standard good enough for everyday use, and this is given us by the fact that looking at a picture at a distance of 10 ins., the distance of most distinct vision, the human eye cannot readily tell the difference between a point and a disc of 1/150 in. in diameter. But this does not mean that 1/150 in. is small enough for the disc of confusion of a miniature negative. The miniature negative is meant to be enlarged, and the disc of confusion will be enlarged too, therefore the miniature must have a smaller disc to start with. A negative to be enlarged 10 diameters and

to be viewed at 10 ins. must have a disc of confusion of 1/1500 in. The matter of perspective may usefully be considered here. We have in imagination been examining a contact print from a whole plate negative taken with a 10 in. lens; we have viewed it from the distance of 10 ins., the distance at which we see it in correct perspective, and we have decided that a disc of confusion of 1/150 in. which is 1/1500 of the focal length of the lens, gives satisfactory definition. In using a miniature, if we arrange for the maximum disc of confusion to be 1/1500 of the focal length of the taking lens, when the resultant negative is enlarged to such a size that 10 ins. is the proper distance for it to be seen in correct perspective, then the maximum disc of confusion will be 1/150 in., which we have decided to be satisfactorily sharp. Owing to these considerations of perspective it is better to connect the disc of confusion with the focal length of the lens rather than with the size of the negative. It will be seen that the idea here is quite simple; it is that an accuracy in the negative of 1/1500 of the focal length of the taking lens will result in a sharpness of definition of 1/1500 of the correct viewing distance in any picture that may be made from that negative. If we fix this standard of 1/1500 of the focal length of the lens, then we may say however small a negative may be made, and to whatever size it may be enlarged, even if it is enlarged to many square yards on a lantern screen, provided it is viewed from the proper distance to give correct perspective, the angular sharpness will be constant, and equal to the standard which we have decided to be satisfactory. We therefore express this in the equation (1), putting $c = f/1500$; the equation simplifies and we get

$$H = 1500\, f/s \qquad (2)$$

and as f/s = the effective diameter of the stop,

$$H = 1500 \text{ times the diameter of the stop.} \qquad (3)$$

If these formulæ are used to determine the hyperfocal distance procedure is much simplified. There is no need to decide what size disc of confusion should be chosen, the formula does that automatically; there is no need to look up a hyperfocal distance in a table, it is quicker to work it out by mental arithmetic. A 2 ins. $f/2$ Summar, *e.g.*, has a H.D. of 1500 times 2 ins. divided by 2, which is 1500 ins. or 126 ft. near enough. In metric measure it is even simpler; for a 50-mm. lens at $f/2$, the diameter is 25 mm., therefore the H.D. is 37½ metres. The curious will note that to an observer at the H.D. a disc the size of the effective aperture of the lens is just distinguishable from a point, as at that distance its diameter subtends 1/1500th of a radian, which is the angle subtended by our disc of confusion of 1/150 in. at 10 ins.

Standard of Definition.

The standard of definition may be varied according to requirements. The standard assumed in this paper, a maximum disc of confusion of 1/150 in. viewed at 10 ins., resulting in the coefficient of 1,500 in equation (2) is a high standard; it is that recommended by the makers of the Leica camera. For many purposes, and particularly if the lens is not of the highest quality, 1/100 in. will be perfectly satisfactory; it is useless to insist on a disc of confusion smaller than the residual errors of the lens; it is certainly good enough for most non-miniature work, and it will be found satisfactory for miniatures except those which are to be greatly enlarged and then viewed from a near distance; it is easier to work than the more exacting standard, and is well worth adoption for ordinary purposes, If this standard is accepted, all the hyperfocal distances will be a third less than those obtained in this article. For scientific purposes a disc of confusion of 1/200 in. at 10 ins. may be required, when by using a coefficient of 2,000 the H.D.'s will be a third greater than our standard. As the limit of human vision is, according to physicists, a disc of 1/350 in. at 10-ins., we may increase the coefficient to 3,500 if we wish, but the grain of the emulsion may have to be considered; it is useless to stipulate for a disc of confusion smaller than the grains of which the image is composed, so that it will be an unusual case that is not satisfied by a coefficient between 1,000 and 2,000. It will be seen from this that there is no definite value for the H.D., it is a question of the standard of sharpness required. If two authorities give different H.D.'s for the same lens at the same stop, it does not follow that one of them must be wrong; it merely means that the greater H.D. will give more trouble in focussing but the sharper picture.

Telephoto Lenses.

Taking as an example a camera using Leica film and fitted with a normal* 2″ lens, the negative will be enlarged five diameters to about 7 × 5-ins. to be viewed at 10-ins. (2″ × 5 = 10″); this gives correct perspective. If a 5″ lens is used, the small negative should be enlarged only 2 diameters to be viewed at 10-ins., and the formula, as a good scientific formula should, gives the correct H.D. for standard sharpness at that enlargement. But it is certain that the negative will be enlarged to 7 × 5-ins. and viewed not at 25-ins., the correct distance for that size, but at the usual 10-ins. When the narrow

* By a "normal" lens is meant a lens of focal length approximately equal to the diagonal of the negative.

path of scientific rectitude is left, trouble may be expected, and it will be found in the shape of incorrect perspective, the "telephoto effect" where in the cricket match, bowler, batsman, and longstop, all are represented as about the same size. Also if the full-sized enlargement is to stand inspection at the closer distance and shew standard definition, the disc of confusion must be diminished, or the H.D. increased, in the ratio of the focal length of the lens used to the normal focal length. Thus if a "two-power" telephoto is used the H.D. should be doubled, if a "three-power," trebled. If in a miniature, a 13·5-cm. lens at $f/4·5$ is used, the H.D. is 45 metres, but if the negative is to be enlarged and viewed as if it had been taken with a 5-cm. lens, this H.D. will have to be multiplied by 13·5/5, and becomes 122 metres.

Wide Angle Lenses.

The cure for this incorrect perspective is simpler; the true cure for the telephoto, keeping the print small, is not acceptable, but the W.A. negative can easily be enlarged to a greater size. The miniature taken with a 3·5-cm. lens should be enlarged, not to 7 × 5-ins. but to 10 × 8, when, as 36-mm., the length of the negative, is to 35-mm., the focal length of the lens, very nearly as 10-ins., the length of the print, is to 10-ins., the viewing distance, the perspective will be correct.

Advantages of this System.

There are many unmathematical users of cameras who are content to be dependent on tables to look up numbers to give them good focus. But there are a larger number of photographers who wish to understand, not only what they ought to do but why they ought to do it; to such this system offers, at a minimum of mental effort, a comprehensive understanding of the hyperfocal distance from the practical point of view. It is applicable to any lens and any camera; it draws attention to the important point of true perspective; it is independent of all tables, thus reducing by one the number of things which may be lost or left at home; it can be carried in the mind and any calculations made on the back of an envelope; it is perfectly flexible, any standard of definition may be selected in the shape of a coefficient 1,500 or the like, and when that selection is made the particular form of the equation (2) relieves the user of any trouble about choice of a disc of confusion, for the equation sees to that automatically. Selection of the appropriate disc of confusion, which is different for each size of negative, is a worrying business, and its abolition, by making the disc dependent on the focus of the lens, is a great improvement. True, a small extra calculation has to be made for a telephoto,

but that may be endured as a lenient penalty for infringing the laws of perspective.

Having found our H.D., the next problem is how to use it.

METHOD I.

If the lens is focussed on the H.D., focus extends from half the H.D. to infinity. Suppose we are doing landscape work, and want everything distant in focus, using an $f/2$ lens. Focussing on 126-ft. we shall have everything sharp beyond 63-ft. This will not be near enough. Stop down to $f/4$. H.D. becomes 63-ft. Focus on that and everything is sharp beyond $31\frac{1}{2}$-ft. Stop $f/8$, focus on the H.D. $31\frac{1}{2}$-ft., and all is sharp to $15\frac{3}{4}$-ft. Or stop $f/16$, focus on $15\frac{3}{4}$-ft. and all is sharp to $7\frac{7}{8}$-ft.

METHOD II.

Divide the H.D. by 0, 1, 2, 3, 4, 5, &c., in succession, and get the numbers Infinity, 126, 63, 42, 31·5, 25·2, 21, 18, 15·75, 14, 12·6, 11·5, 10·5, 9·9, 9, 8·4, 7·9, &c.

Focus on any one of these distances, say 21-ft.. At full aperture focus will extend one step each side, from 18 to 25·2-ft. Double the stop number by stopping down to $f/4$, and focus will extend over two steps, from 15·75 to 31·5-ft. Quadruple stop number (use $f/8$), and focus will extend over four steps each way, from 12·6 to 63-ft. Multiply stop number by 8, by using $f/16$, and everything will be sharp eight steps each side, from 9-ft. to past infinity.

METHOD III.

If the lens is focussed on the distance D, and if D_1 and D_2 are the distances of the farther and nearer limits of definition, then

$$D_1 = \frac{HD}{H - D} \text{ and } D_2 = \frac{HD}{H + D} \qquad (4)$$

these are in the ratio of H + D to H — D.

The extent of focus behind and in front of the plane focussed on, is $\frac{D^2}{H - D}$ and $\frac{D^2}{H + D}$ respectively (5)

which are also in the ratio H + D to H — D.

If definition is required between the farther and nearer limits D_1 and D_2, then the distance to focus on, D, by eliminating H from the equations (4), is

$$D = \frac{2D_1 D_2}{D_1 + D_2} \qquad (6)$$

Similarly, eliminating D from (4), we get the H.D.

$$H = \frac{2 D_1 D_2}{D_1 - D_2} \qquad (7)$$

EXAMPLE OF THE USE OF ABOVE.

Definition is required between 12 and 20-ft. with a 4″ lens; what distance must be focussed on, and what is the largest stop that may be used?

By (6), distance D to focus on is 15-ft. By (7) H must be 60-ft. By (2), f being 1/3-ft., s is $\frac{1,500}{3 \times 60} = \frac{25}{3}$. So $f/8$ will just not do it. The flexibility of the system is easily demonstrated; if at this late stage of the calculation we decide that the less exacting standard will be sufficient, as the stop numbers are by (2) proportional to the discs 1/100 in., &c., or inversely proportional to the coefficients 1,000, &c., all we have to do is to take 2/3 of 25/3 and get $f/5{\cdot}5$ as the stop to be used. Or if 1/200-in. at 10-ins. is to be our standard, we take 4/3 of 25/3 and get $f/11$.

METHOD IV.

Subtracting (4), or adding (5), we get the whole depth of field

$$= \frac{2D^2 H}{H^2 - D^2} \qquad (8)$$

and for large apertures and near distances, so that D is small compared with H, depth of field is

$$\frac{2D^2}{H} \qquad (9)$$

This is a very accurate approximation; if D is as much as 20 per cent. of H, the error is only 4 per cent. This is a useful formula for reflex work. It is not practicable to note the focus at three places at once, the principal plane, and the near and far limits where definition is required; but if we know beforehand the extent of sharp focus, we can concentrate on focussing on the principal object. For a 6″ lens at $f/4{\cdot}5$ H.D. is 165-ft., and by (9) depth of field at 12-ft. is 21-ins., of which rather more than half is behind, and rather less than half is in front of, the plane focussed on. For other distances, depth varies as the square of the distance; halve the distance, depth is a quarter; at one third the distance, depth is one ninth. For different stops, depth varies as the stop number; double the stop number, double the depth. The standard of 1/150-in. at 10-ins. has been adhered to in this example, but it is eminently a case where the 1/100-in. would be perfectly satisfactory: H.D. would be 110-ft. and depth at 12-ft. would be 32-ins.

CHOOSING APPARATUS FOR SUB-STANDARD CINEMATOGRAPHY.

By George H. Sewell.

The newcomer to sub-standard cinematography, faced with the embarrassingly large array of apparatus which is available, is often at a loss as to where to start in an attempt to arrive at a correct choice of equipment. I hope in this article to be able to assist him in that choice.

Film Sizes.

There are three most general sizes, described by the width of the film, as 16 mm., 9·5 mm., and 8 mm. Other sizes have been introduced, but their use is very limited, although reference should be made to 17·5 mm. film, which is specifically designed to give large projected sound pictures from compact apparatus for educational and propaganda purposes.

Running Costs.

If adequate use is to be made of the apparatus, film stock must be purchased from time to time and constitutes the chief factor in determining the cost of the hobby.

The correct standard of comparison is the showing time on the screen, and comparing similar types of film in the three sizes the relative costs for a period of four minutes would be :— 16 mm., 26s. 0d. to 32s. 6d.; 9·5 mm., 14s. 0d. to 18s. 0d.; 8 mm., 10s. 0d. These prices are for black and white and include film and processing, but not the cost of additional titling or other services. 16 mm. colour film costs approximately 40s. 0d. for the same showing time. It is anticipated that 8 mm. colour film will be available shortly. There is no 9·5 mm. colour film.

Film Libraries.

Hire library facilities in the various film sizes should be considered. The most complete silent film libraries exist in 9.5 mm., where many old silent masterpieces, comedies and films of other types are available. There are some excellent 16 mm. silent libraries. At present choice in the 8 mm. field is more limited.

16 mm. offers an increasing range of sound-on-film library facilities, including educational, propaganda, interest and entertainment films.

Comparative Advantages.

Briefly, one would summarise the advantages of the various sizes as follows :—8 mm., most compact, light and portable ; least expensive ; most suited for purely " personal " movies ; few library facilities. Price range of apparatus £10 to £40 approx. 9·5 mm. nearly as compact ; suitable for " personal " movies and also more elaborate work ; suitable for personal experimentation and home processing ; shows pictures of reasonable size, and the more powerful projectors are suitable for work in clubs and small halls. Excellent library facilities. Price range of apparatus £5 to £60 approx. 16 mm. Most expensive but most versatile of all sub-standard film sizes ; in general the apparatus is the heaviest but a few of the latest cameras are very light and compact ; suitable both for personal movies and more elaborate professional and semi-professional production and projection ; good library facilities, both silent and sound ; world wide distribution and processing services ; price range of apparatus from £10 or £12 up to £120 to £150, the more elaborate apparatus almost as complete and able to do nearly as much as professional apparatus. Largest projectors will give picture size sufficient for audiences of several hundred.

Sound.

In 16 mm. sound-on-film cameras and projectors are available at prices ranging between £150 and £200, the projectors being capable of demonstrating both sound and picture to audiences of several hundred.

Choosing Apparatus.

In choosing apparatus immediate requirements should be considered carefully and future expansion should not be forgotten. It is generally unwise to purchase apparatus that is so self-contained that additional facilities can only be secured by exchanging the entire apparatus. As an example, some cameras do not permit of the use of any lens other than the one built into the body of the instrument.

Generally speaking I am not in favour of the combined apparatus, which embodies both camera and projector in one machine. The requirements of taking and projecting are dissimilar, and any combined apparatus along existing lines of design must compromise on both.

Camera and Lenses.

For the beginner I recommend a simple camera with a fixed focus lens of an aperture of the order of $f/3 \cdot 5$. "Fixed focus" merely means that the lens is set to such a focus that the majority of the field will appear sharp without the user of the camera having to worry about setting the focus. This cannot be done with large aperture lenses, but with modern fast film $f/3 \cdot 5$ will be adequate for all ordinary out-of-doors work for a large part of the year.

When the beginner feels he is sufficiently practised he can enlarge his range of lenses by acquiring one of normal focus, but of the focussing type and with an aperture of the order of $f/1 \cdot 9$. He should not discard his fixed-focus lens. Later acquisitions can be a long-focus lens of either normal or telephoto type, and two to three times the normal focal length, and a wide angle lens. I do not recommend the purchase of abnormally long-focus telephoto lenses, unless there is some real or specific need for them, e.g., for natural history work. These special lenses require special skill in use, and for the normal person are unwieldy and produce unconvincing pictures if not handled correctly.

Tripod.

Whenever possible the camera-man should use a tripod or a support. Such a tripod should be a properly designed, sturdy cine tripod. Where a tripod is not convenient much assistance can be obtained from a unipod, either of the walking stick type which reaches the ground, or the short type which fits into a belt worn by the operator.

No shot with a telephoto lens should be made without a tripod and no shot made without a tripod can be as steady as one made with a tripod. For serious work the value of the tripod is that the shot can be composed accurately and the camera left fixed in the correct position.

Methods of Loading.

The two methods deserve consideration. They are (*a*) daylight spool loading, and (*b*) charger or cassette loading. 8 mm. cameras come in class (*a*); most 9·5 cameras are in class (*b*), with a few in class (*a*); most 16 mm. cameras are in class (*a*) with a few in class (*b*). The respective advantages and disadvantages are as follows :—

Spools.—Spools are interchangeable, i.e., spool loading cameras will take any spool-packed film of any manufacture. This gives the user the widest possible range of choice. Loading is rather more complicated and takes longer than with chargers,

but once the film is loaded it runs through smoothly and with the minimum of difficulty. Once the camera starts to run and the film to unwind from the feed-spool, the camera cannot be opened without fogging the film until the whole coil has been wound off on to the take-up spool and is once more protected by a safety leader. Loading and unloading must be done with some care to shade the spool, otherwise there is danger of light fogging the edges of the film.

Chargers.—In the 9·5 mm. field, chargers are interchangeable.* In the 16 mm. field, chargers are individual, each charger is designed for one camera and will not fit others. Only a few brands of film are available in these 16 mm. chargers and it is not permitted to pack other types of film into them.

* Pathescope have just put out a new camera which will only take a special type of charger, but that charger will fit the other cameras.

Loading the camera with film in chargers is very rapid, in some designs being a matter of only a few seconds. When the camera is loaded it can be opened at any time without fogging more than a very short section of film. There is perhaps a little more tendency for the charger loaded camera to jam, but access is easier to enable such trouble to be put right. The film is much better protected from light action and loading can be carried out in bright light with less danger of fogging.

Films.

A survey of films available can be found in the Technical Section, under the heading " Cinematography."

Filters.

The absolute beginner should avoid filters until he has learned the basic facts of cinematography without them.

Exposure Meters.

An exposure meter will rapidly save its value in film. From the cine point of view we will consider only two types: (*a*) Extinction, and (*b*) Photoelectric. The extinction meters allow for visual inspection of the scene through various devices which stabilise the eye-response to the subject and exposures can be calculated rapidly from the reading obtained by means of scales incorporated in the meters. The weakness of the system is that the visual rather than the chemical values of the light are measured. The photoelectric meter measures the chemical or actinic quality of the light by means of a photo-sensitive cell which operates a sensitive galvano-

meter. Here again suitable scales enable the exposure to be calculated rapidly from the reading obtained.

PROJECTORS.

The choice of projectors again depends on the intended purpose. Do not be tempted to buy an expensive powerful projector merely because it is "the latest." A projector can be too powerful as well as too weak, with equally undesirable results. Wattage alone is no indication of the efficiency of the projector, as the efficiency of the optical and condenser system is of first importance. Good light emission should not have been obtained at the expense of the ability to bring *and keep* the picture in sharp focus *all over the screen*. For black and white projection a modern instrument using 250 watts will be sufficient for all ordinary purposes, while 500 watts will show colour film adequately. The higher wattage instruments are most suitable for semi-public, small hall and club work and should be confined to those purposes.

SCREENS.

Screens are of three types, (*a*) white, (*b*) beaded and (*c*) silver. The last two possess much higher reflective powers than the first, but this property is restricted to a fairly narrow angle. With adequate light the white screen surface is, in my personal opinion, by far the most truthful and it gives the best dispersion, so that people at all angles to the screen see the picture with almost equal brilliance.

There is a tendency to show too large a picture in many cases. For home projection a useful rule is that the ideal viewing position is from a point half-way between projector and screen, when the normal focus projection lens is in use. If possible no member of the audience should be placed closer to the screen than this or called upon to scan a wider angle of vision than this entails. In public shows, where such conditions cannot be adhered to, longer focus lenses should be used. A range of two or three additional lenses is available for most projectors.

OTHER ESSENTIAL ACCESSORIES.

In addition to the above, certain other equipment is essential for efficient conduct of the hobby. This accessory apparatus includes a rewind, a splicing outfit, cleaning materials, film cans and preservative fluid.

Purchase a first class rewind, with sturdy fittings and on a good massive base, and with both heads geared and running sweetly. It will be worth every penny you pay for it.

The splicing apparatus, too, should be of good quality. Splicing is precision work of the highest character and must be done on properly designed apparatus which is kept scrupulously clean. It will ensure absence from jerky projection and unwanted breakdowns. Suitable film-cement for your own brand of film must be obtained and kept in a well-stoppered bottle. The brush used for applying the cement should be of good quality with the bristles bound in quill. Avoid ordinary metal ferrules which contaminate the cement, and do not let the bristles get bent.

Dirt acquired during projection will gravely damage the film during subsequent projection. There are a number of cleaning fluids available on the market, with adequate directions for use. The cleaning rags should be fluffless in character, old and well-washed linen being the best. Avoid silky materials.

Films should, whenever possible, be joined into 400 ft. lengths, spooled and kept in proper humidor cans. These cans are circular with a pad in the base which is sparingly moistened with a preservative fluid. Shorter lengths of film can be kept together, on spools, in a large biscuit tin or similar container, with a moistened pad in the bottom of the tin. There are a number of proprietary preservative fluids on the market.

Conclusion.

Many other fascinating accessories will tempt you, but spend your money first on the essential articles mentioned above, which together constitute what may be termed a basic equipment for sub-standard cine workers.

POLARISED LIGHT IN PHOTOGRAPHY

By Bernard Alfieri, Jnr.

By means of polarised light, photographs can be taken that have hitherto been beyond the scope of a camera; but like many other important modern developments, the knowledge and theory underlying the subject has been ably demonstrated and clearly defined long before the appearance of apparatus that makes its practical application of any service to the photographer.

As far back as 1669, Erasmus Bartholinus observed the double-refraction of Iceland spar, a crystal that split up a beam of light into two separate portions. One ray, known as the ordinary ray, obeys the law of refraction discovered by Snell, the other ray, called the extraordinary ray, does not follow this law, and the index of refraction is not constant. Huyghens demonstrated the characteristics of the two beams, which Newton at a later date described as polarised light. In 1808, Malus remarked that light reflected from the windows of the Luxembourg Palace in Paris was polarised at certain angles, and this accidental discovery is responsible for many practical applications of polarised light to-day.

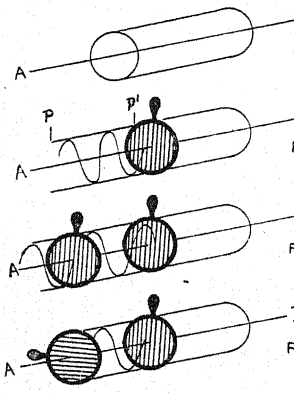
The double-refraction of Iceland Spar, whilst good enough to permit a wealth of experimental work, was of no practical value for photography, and it was not until William Nicol, in 1828, produced his famous prism that much progress was possible. The Nicol prism consists of a crystal of Iceland Spar cut at a certain angle, the surfaces being polished and re-united with the object of shunting the ordinary ray to one side, only leaving the polarised light to pass through, and although a Nicol prism has not been surpassed for transparency, the working aperture is naturally confined to the size of the crystals, which have become scarce.

Prof. A. F. C. Pollard[1] draws attention to the recent work of E. H. Land, who in making use of the dichroic properties of certain substances, has rendered possible the production of a simple screen for filtering out common light, passing a high percentage of plane polarised light through large apertures. This screen is described as a thin sheet of nitro cellulose packed with ultra-microscopic crystals of herapathite with

(1) "Nature," Aug. 22, 1936, p. 311.

their optic axes all parallel to one another and in the "B.J." Analecta 4th September, 1936, we find reference to the polarising screens of the Polaroid Corporation (Boston) with notes on their efficiency which has been measured within the region of from 4,000A to 20,000A.

In order to appreciate the nature of a polarising screen and its practical uses in photography, it is necessary to have a clear, if somewhat diagrammatic conception as to its action on light, which for the sake of simplicity can be pictured in the following manner. Ordinary light is said to consist of waves in the ether that vibrate in every direction normal to the line of propagation. We are not concerned with the length or frequency of the waves which determine the colour, but simply with the direction of vibration, which is illustrated diagrammatically in Fig. 1, where the line A-B is the direction of propagation surrounded by an infinite number of waves in every possible direction at right angles to the line, which is shown as a cylindrical space of disturbance. Fig. 2 shows the action of a polarising screen which has only passed waves vibrating in one direction, the band P-P¹ representing plane polarised light. If a second polarising screen is placed in the path of the polarised beam, providing the vibration plane of the second screen is in the same direction as that of the first, the polarised light will pass through as illustrated in Fig. 3. But if the second screen is turned through a right angle as shown in Fig. 4, it will quench the light.



Figs. 1 to 4.

From this it will be seen that if the light comprising a given subject consists of a mixture of polarised and ordinary light, it will only be necessary to adjust the angle of a polarising screen placed before the lens of a camera, to control the polarised portion, and even prevent it reaching the film at all.

There are two factors that help to make a polarising screen of practical use in general photography, firstly, the discovery of Malus, that light reflected at roughly an angle of 30° is polarised, and secondly, that light from a clear blue sky at right angles to the sun's rays is also strongly polarised.

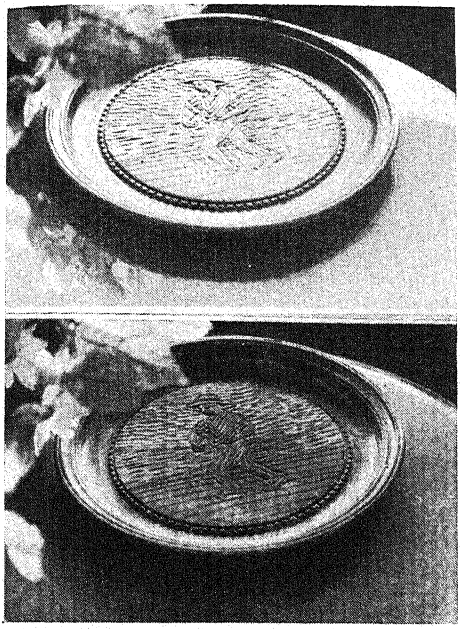


Fig. 5 (above). Wooden dish standing on glass top table.
Fig. 6. Same subject photographed through Pola screen. Vertical setting, index handle at 8.

A practical example of the former is shown in Fig. 5, where a wooden dish has been arranged to reflect daylight at an angle of about 30°. Fig. 6 shows the same subject photographed through a Pola-screen, the vibration plane of which has been turned to a vertical direction.

It is logical that if the vibration plane of a screen must be at right angles to the direction of vibration in a reflected beam in order to absorb it, in the case of a subject made up of two reflections, one at right angles to the other, these could not both be effectively quenched at the same time. Fig. 7 offers a practical illustration of this case, where a table top and box reflect light in a horizontal direction, and a picture frame glass reflects the image of flowers in a vertical plane, both being roughly at an angle of 30° with the line of sight.

In Fig. 7, the polarising screen is in the same position as for Fig. 6, that is the vibration plane of the screen is in a vertical position, which reduces reflections from the horizontal surfaces. In this position the reflection of the flowers in the glass of the frame shows to advantage. In Fig. 8, the screen has been turned through a right angle, and now passes, and even encourages the horizontal reflections on the table top, but absorbs the vertical reflections of the flowers in the picture glass. Where the screen is turned through an angle of 45°, we shall partly reduce reflections in either plane, without

being able completely to absorb them, a fact that offers considerable help in some subjects such as the stone font illustrated in Figs. 9 and 10. One of these is a straight photograph, the other being taken through a polarising screen, with its vibration plane at an angle of 45°.

Figs. 11 and 12 illustrate the use of a screen to deepen the tone of a sky, where white clouds on a blue ground are practically invisible when photographed in the ordinary way without a filter, but clearly show when the vibration plane of the screen is in a direction pointing towards the sun, that is when the photograph has been taken at right angles to the sun's rays. There would have been no change in tone if the picture had been taken looking either directly into, or away from the sun.



Fig. 7. Setting 8 for screen, the same as in Fig. 6. Note the reduction of surface reflections from the table top, but very marked reflection of flowers in picture glass.



Fig. 8. Setting 0, or Zero, same subject and lighting as in Fig. 7. Note the reflections on surface of table (horizontal reflections) and the absence of reflections from flowers in picture glass (vertical reflections).

Before adding to the applications of polarised light in photography, it may be of service to deal with the screen itself in a practical manner. Messrs. Kodak, Ltd., have lent me duplicate Pola-screens in order to obtain some of the accompanying illustrations; these instruments are offered for sale in a metal rim or holder, which is fitted with a handle arranged in a line with the vibration plane of the screen itself. Holders and hoods, or light shields are also available which

enable the screens to be conveniently fitted to most cameras, and similar fittings will be manufactured for use on small cameras.

Messrs. Carl Zeiss, Jena, also market screens, known as the Herotar suitable for use on small and large cameras, including process cameras. Larger screens Type 2, not mounted between optically correct glass, can be used to cover lights in studio work.

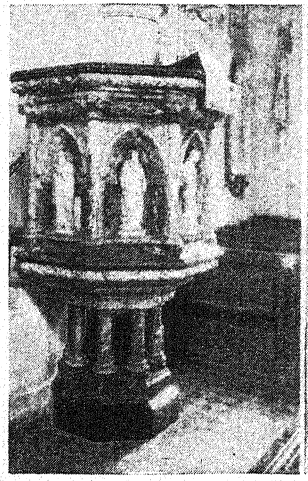


Fig. 9. Stone font in Ewell Church.

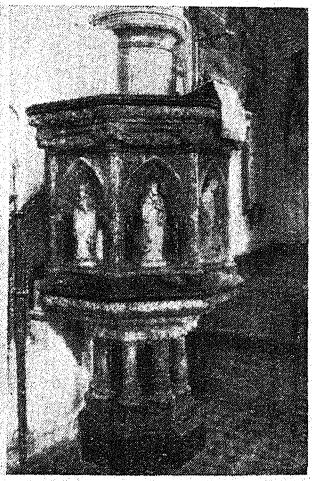


Fig. 10. Same subject photographed through Pola-screen, setting 1, that is with the vibration plane of the screen at an angle of 45°.

Due to a slight scatter on the surface of the screen, it is essential to employ a good light shield or hood, in front of the screen, and obviously the mounting must permit of freedom to turn the screen round through slightly more than a right angle. It is an advantage for the holder to provide for the use of a colour filter as well, as there are applications for the use of coloured filters in combination with the polarising screen. The Kodak holder has been graduated in reference numbers as a guide to repetition work, and in the case of totally polarised light, an index of relative efficiency. The numbers are arranged round the outside rim of the combined holder, and are read against the index handle of the screen, starting with O, or Zero, in a horizontal position, 1 being at an angle of 45°, then continuing to 8, which is vertical. Each



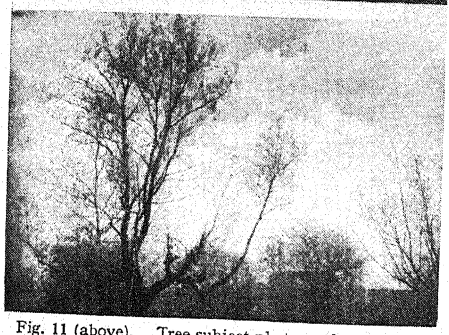


Fig. 11 (above). Tree subject photographed without screen.

Fig. 12. Same subject, photographed through Pola-screen, index handle pointing towards the sun.

adjacent number effectively reduces the brightness of a completely polarised highlight by one half. The numbers have no relation to the exposure factor, and have no significance when used in partly polarised light.

The Kodak Pola-screens are stated to have a spectral range of polarising power from 400 to 700 mμ. They absorb short waves in the ultra-violet band, but freely transmit without polarisation the long infra-red waves, which permits a pair of crossed Pola-screens to be used as an infra-red filter.

Exposure is increased for panchromatic emulsions up to about 4 times when a single polarising screen is used before the camera lens, and as much as 10 times for totally polarised light where polarising screens are used both over the lights and in front of the camera lens. Non-colour sensitive material requires slightly longer exposures.

Let us take the most practical applications, starting with a single screen over the camera lens.

1. Dark sky effects where there is blue sky present; the sky tone, as shown in Fig. 12, can be deepened, the greatest effect being at right angles to the sun's rays. In this position, that is with the index handle pointing towards the sun, in combination with a red filter, night effects can be obtained. Take away the filter, and by adjusting the relative angle of the screen, any sky tone from that obtained by the red filter

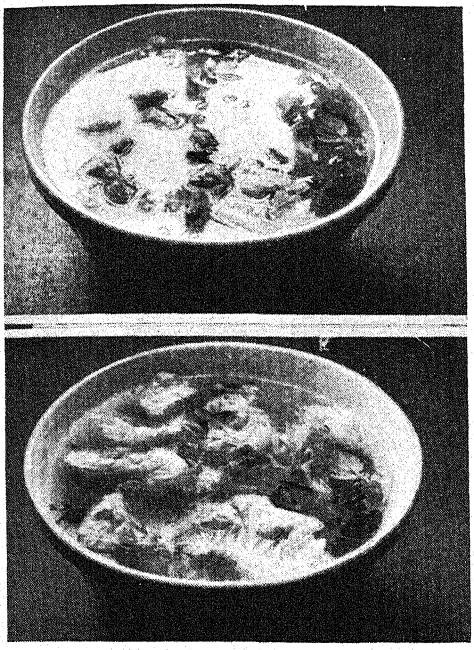


Fig. 13 (above). Bowl of lettuce with reflections on surface of water.
Fig. 14. Same subject, where the Pola-screen, setting 8, has absorbed the oblique reflections on the surface of the water, to show detail underneath.

to no filter at all can be controlled at will, those tones obtained with the polarising screen alone without any colour distortion of foreground objects. This has been stated as the only known method of obtaining dark sky effects in colour photography.

2. Removing oblique reflections from non-metallic surfaces at roughly an angle of 30°, which can be used to show up the surface detail of shiny objects, or to kill reflections on the surface of glass or water, in order to show up objects behind or underneath. A good example of this is shown in Figs. 13 and 14, where the surface reflection on water in a bowl has been totally absorbed and the detail can be seen under the surface. This being a horizontal reflection, the vibration plane of the screen was used in a vertical position (setting 8). Figs. 15 and 16 show the same effect but with the glass of a shop window, this time in a vertical position, the best setting for the screen being in a horizontal position at O, or zero. It is interesting to note in this example how the effectiveness of the screen decreases further along the windows, due to the altering of the angle, which commenced in the foreground only, at roughly 30°.

3. Architectural work offers opportunities for the polarising screen as considerable control is possible over the relative



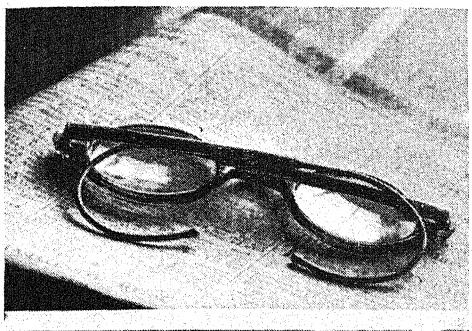
Fig. 15 (above). Shop window, with reflections on the glass.

Fig. 16. Same subject, photographed through Polascreen, setting 0. or Zero. Note how the efficiency of the screen falls off, lower down the window glass, where the angle of 30° is not maintained.

brightness of walls and ceiling, apart from killing or reducing local reflections. The most marked effects are when blue sky is present, and at certain angles the relative brightness of windows can be subdued.

4. Absorbing specular reflections — Apart from oblique surface reflections as we have dealt with them, there is the question of specular reflections on surfaced paper or materials, the reduction or total absorption of which will increase the colour saturation. This purifies and deepens the colour tones obtained when photographing coloured prints, and blackens the dark portions when copying matt monochrome prints. Figs. 17 and 18 lead us into this field, where quite apart from the absorption of reflection in the glass of the spectacles, it will be seen that the light has been removed from the surface of the newspaper, which shows up the blackness of the printing ink. This is an example taken in daylight, relying on an angle of about 30°, to obtain the effect; but if the lights are covered with a polarising screen, and a second screen is used over the lens of the camera, it is possible to obtain similar effects without the necessity of arranging the subject at an oblique angle, thus when :—

5. Copying not only can the blacks be deepened on matt or semi-matt prints, but such subjects as a pencil sketch shown in Figs. 19 and 20, can be reproduced in good contrast whereas



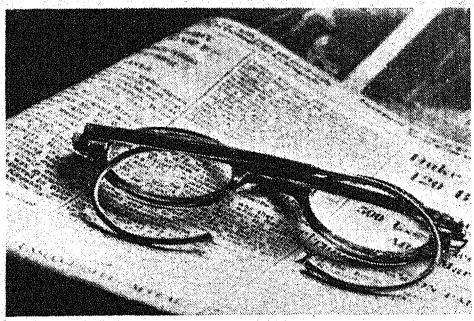


Fig. 17 (above). Subject showing oblique reflections from glass and surface reflections from paper and newsprint. Specular reflections from surface of paper.
Fig. 18. Same subject, photographed through Pola-screen. Note the blackness of the print and greater contrast, apart from the absorption of oblique reflections from glass.

it would have been practically impossible without the aid of a polarising screen to destroy the surface reflection from the pencil. Obviously, this opens a wide field to the block - maker, and gives us another shot to aim at the old protest that a glossy print is essential if a good block is to be made. For this work the relative position of the two screens should be crossed for the greatest effect.

Conversely, objects can be made to appear unnaturally glossy, if the screens are employed in a parallel position, whilst in portraiture the crossed position offers an unfamiliar matt effect that can be controlled through all degrees to the opposite effect of a perspiry, highly reflective countenance.

From the scientific aspect, polarised light offers many advantages which have been enjoyed for years under difficulties. The polarising screen apart from its obvious use in connection with the microscope, enables comparatively big surfaces to be examined with ease, and birefringence of some crystals and fibres causing certain transparent objects to light up in vivid colours when placed between crossed polarising screens can be noticed with silk, cotton wool, and many natural crystals.

It has long been known that certain transparent materials

show birefringence when placed under strain, and this fact has a practical application in recording photographically the stresses and strains of shapes under mechanical tension. On referring to the "Dictionary of Applied Physics" page 507 we find that Brewster calls attention to the production of birefrigence in isotropic media by mechanical stresses, and later Clerk Maxwell attacked the problem mathematically. A model of a mechanical construction is cut out of an isotropic medium (such as glass or xylonite) and the presence of stresses on the model causes the stressed portion to act as a birefringent medium transmitting light which is resolved into



Fig. 19. Pencil sketch.



Fig. 20. Same subject, photographed through Pola-screen, in crossed position with Pola-screen covering the lights. Note blackness of pencil, and greater contrast.

two rays, polarised respectively parallel, and perpendicular to the direction of stress. Birefringence is dependent upon the stress present and not upon the strain. A plate strained beyond its elastic limit may show no optical effect if the actual stress is removed.

Prof. J. Tyndall, in a series of lectures delivered in America as long ago as 1872, demonstrated with complete success a series of practical experiments on the subject by means of a Nicol prism, and the gist of these observations can be seen in a practical way with the aid of two polarising screens.

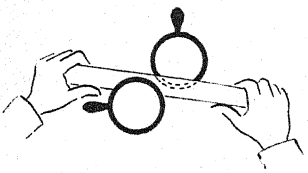


Fig. 21. Experiment to visualise the stresses and pressure on a strip of glass under mechanical tension. (See text.)

Fig. 21 shows two polarising screens in a crossed position, between which a strip of glass is held. In order to see the following experiments clearly, a cardboard shield, or better still, the holder with hood marketed for the screen, should be arranged to cut out extraneous light, the apparatus being placed in a position where strong light can be transmitted by the screens, using a black cloth over the head when viewing the strip of glass through the second screen. When the glass is held freely, it cannot be seen through the screen, which appears dark. Now strain the glass strip, as if it is being bent edgeways, when a brilliant strip of light will be seen along both edges, representing the top edge under a condition of tension, and the bottom edge under compression.

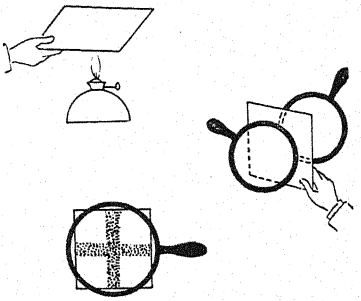


Fig. 22. Experiment to determine, by means of polarised light, the portions of a glass plate under stress, due to expansion by heat. (See text.)

In Fig. 22, a square of glass is heated for a second in the centre by means of a spirit lamp. This when held between the crossed screens, will show the portions under strain. The centre which has been heated will expand, and the areas of the resulting mechanical stresses are clearly defined as four light or transparent portions leaving a dark cross on the glass; this cross increases in size as the plate cools, until when all pressure is removed it is no longer visible.

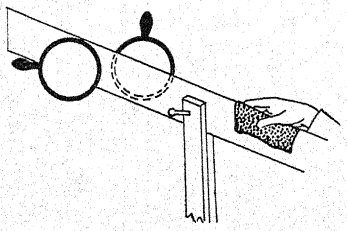


Fig. 23. Vibration caused by rubbing, seen by means of polarised light. (See text)

Fig. 23 shows the production of stresses and strains by means of

vibration. Here the strip of glass is held in a clamp, and is caused to vibrate by moving a wet rubber along it. As a sound is produced on the glass, the latter is thrown into a state of rapid vibration; each moment of compression will cause it to be viewed through the screens as a flash of light, which will also be the case during each moment of strain, the effect being too rapid for the eye to follow, the glass strip having the appearance of lighting up each time a sound is heard. From these experiments, which are only on the fringe of the subject, it can easily be realised what possibilities are opened, and how models of varying shape made to represent proposed parts of a constructional whole, can be examined and recorded under working conditions to determine the amount and location of the stresses and strains they will be called upon to withstand.

OVER-RUN LAMPS FOR PHOTOGRAPHIC PURPOSES

By Harold Bright, M.A., M.R.I.,
and Stanley W. Bowler, A.R.P.S.

The increasing use of lamps that are burnt at a voltage greater than the normal rating in order to increase the light efficiency for photographic purposes, prompted the following investigation. A number of controlled experiments were made in order to determine how the characteristics of the lamp alter with different conditions of applied voltage, burning position, and other factors which affect its life and efficiency. This article summarises the results and draws a number of conclusions.

It is generally known that the light output of any lamp is increased and the life decreased when the voltage is raised above that at which the lamp is rated to burn. Figures are available in the British Standard Specification No. 469—1932, but these do not extend above an increase of voltage of 20 per cent. It is worthy of note that no curve is published in the specifications relating to ordinary lamps as one might expect. In the case of certain types of lamp, with a specified burning position, i.e. cap up or cap down, it is also known that the life is affected by a deviation from the normal burning position, though whether this applies strictly to the usual type of lamp when over-run is doubtful. In America, there are much larger types of lamp which are over-run, the largest being rated at 1,000 watts, with an efficiency of 33·5 lumens per watt. Some data on these and several other lamps which are used for photography and for cinematography can be found in an article on the " Color Quality of Incandescent Lamps " by Farnham and Worstell, in the Journal of the Society of Motion Picture Engineers, U.S.A., September, 1936, pp. 260-6. In a previous issue of the Almanac (1936, pp. 224-5), a brief reference is made to a method of increasing the light output of enlarging illuminants by means of a variable resistance. At that time, however, no critical measurements of efficiency had been made. Another application of over-running is the mercury-vapour discharge tube, which can be made, under such conditions, to

give a spectrum approaching that of sunlight, instead of the characteristic marked line spectrum.

The investigations about to be described may be divided broadly into two sections, one dealing with the economic efficiency of over-running lamps, and the other with the purely photographic aspect of the problem.

As a result of experience gained in earlier experiments aimed at providing an economical source of illuminant, the cheapest possible lamps, obtainable at chain-stores, have been used throughout the tests. It will be realised that the choice was indicated in view of the large number of lamps burnt to destruction to provide reliable averages for the data required. The lamps used were " Sunshine " pearl type, rated for normal burning at 110 volts and consuming at this voltage, 100 watts.

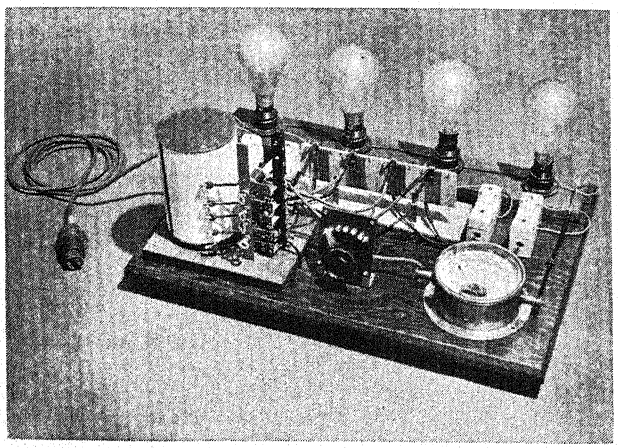


Fig. 1. *Courtesy, Richards and Bright.*

The apparatus shown in Fig. 1, was devised to enable accurate records to be obtained automatically of the life of lamps when tested at varying voltages. The records of the lives of four lamps are made on the clock-work drum recorder to the left of the board, by means of pens which are held in contact with the paper by a magnet energised with the current in each individual lamp circuit. In the centre of the panel there is an insulated heat-proof strip, on which are wound four resistances. These are capable of being adjusted so as to allow a proportion of the mains voltage of 200 to be applied to

each lamp. Four single pole fuses, one for each lamp circuit, and rated at 2 amperes, are also provided. The voltage on each lamp may be read by means of the voltmeter which can be connected into any lamp circuit by means of the selector switch at the front of the panel.

As four lamps were burning at the same time, and at the same voltage, a fair average could be hoped for, but the results obtained far exceeded expectations. Little variation was found between any of a group of four burning at any one voltage. One example will serve to illustrate this point. At a voltage of normal plus 75 per cent., four lamps burnt out in the following times and order :—1, 2 hours; 2, 2 hours 5 minutes; 3, 2 hours 5 minutes; and 4, 2 hours 30 minutes. Similarly close figures were obtained at other voltages.

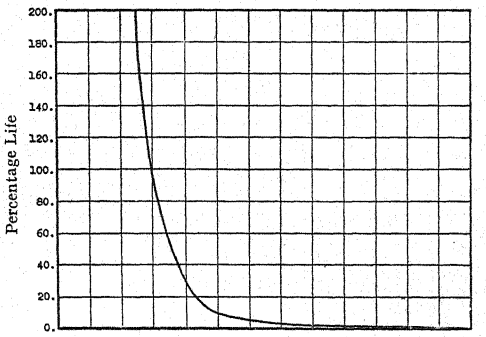


Fig. 2.

The results of the first part of the investigation are plotted in graph form in Fig. 2. The figures for the lower part of the curve were obtained with our own tests and closely follow those already available in the B.S. Specification mentioned previously. Similar results are also mentioned by G. Gronostayski in the Photo-Revue (Paris, 1st August, 1936). Although this graph gives the total life of the lamp when burnt continuously, it does not indicate what total life may be expected in practice, since in normal use the lamp is switched on and off a large number of times. For this reason, a second piece of apparatus, not illustrated, was devised to simulate the desired practical conditions. A constant speed motor was coupled through a reduction gear to a contact breaking mechanism which switched the lamp on and off. The contact breaker was designed to light the lamp for a period of twenty seconds (an assumed average time for taking one " still " photograph, or one short sequence with a cine-camera) and then to allow it to cool to room temperature again before re-lighting. A period of about a minute-and-a-half

was found ample for cooling, and enabled the mechanism to be arranged with a two-minute cycle. In order to determine the life under these conditions, a counter was connected into the lamp circuit and operated through an electro-magnetic device; an impulse being given each time the lamp was switched on. Fuses were also included in the circuit to protect the apparatus at the time when the lamps burnt out. These intermittent burning tests provided some very useful information, for it was found that the life under these conditions was very much less than when the lamps were burnt continuously. At a voltage of 75 per cent. above normal, for instance, the total burning time of the lamp as determined from an average of the aggregates of the number of times a group of lamps had been switched on prior to extinction, was 36 minutes. This gives a figure of 108 possible exposures of twenty seconds duration. Unfortunately, it was not possible in the time at our disposal, to make a sufficient number of tests of groups of lamps burnt intermittently at various voltages, to provide enough data to be able to plot in graph form, the results as against those results obtained from the continuous burning tests.

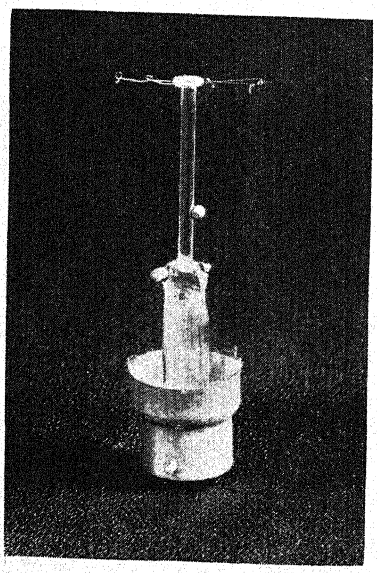


Fig. 3.

Concurrently with this part of the investigation several isolated experiments were made to determine what happens to the lamp when it actually burns out. Some doubt, and apprehension, had been expressed by an independent observer as to the probability of lamps bursting due to the excess voltages applied to the filaments, with the consequent rise in both temperature and gas-pressure. Tests were made with voltages up to normal plus 110 per cent., and even at this point no bursting of the glass envelopes has been recorded, although the lamp tends to burn out almost immediately this voltage is

reached. Apart from these higher figures, no actual bursting or breaking of the envelope was recorded during the whole of the experiments. Figs. 3 and 4 are photographs of lamps which have been allowed to burn out and to maintain the arc which formed between the leading-in wires of the filament coil. It will be noted that in Fig. 3, the arc has been maintained right down to the point where the leading-in wires pass through the glass pinch, a globule of molten metal having been deposited on the stem. The lamp in this case was burnt with the cap down. In Fig. 4, the lamp was burnt with the cap up, and it will be seen that although molten metal from the arc has dropped on to the spherical portion of the envelope and has actually punctured it in more than one place, no complete rupture of the glass has occurred. During the time this arc was maintained, lasting some five to ten seconds, a current of about 10 amperes was taken, thus proving the necessity for properly fusing the circuits on which over-run lamps are to be connected.

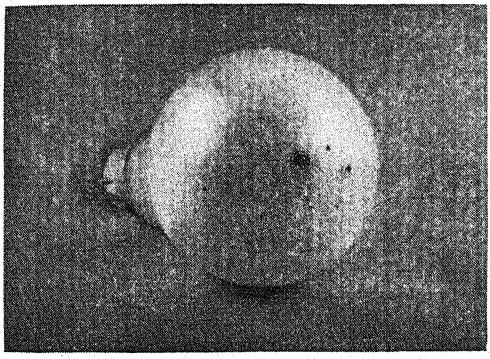


Fig. 4.

The curve in Fig. 5, is obtained by plotting luminous output against applied voltage. A study of the graph shows that the output increases rapidly as the voltage is raised; and as the slope is greater at higher voltages, it follows that a greater increase in output is obtained under conditions corresponding to this portion of the curve.

This increase in light output, as has been previously stated, is only obtained at the expense of an enormous decrease in the life of the lamp. For practical purposes it is necessary to use the lamp under conditions which conform to such a portion of the curve, that a reasonably high output is obtained at the same time as a reasonable length of life may be expected. We have found that a 75 per cent. increase in voltage above normal increases the light output by 300 per cent. and gives the lamp

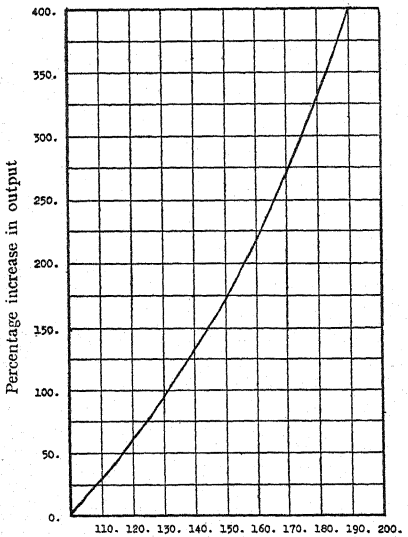


Fig. 5.

a 2 hour life when burnt continuously. If, however, as must be the case, the lamp is switched on and off many times, its life may be decreased to a little over half-an-hour. This difficulty can be overcome to a great extent by raising the voltage gradually to the required point by means of a sliding resistance. A possible explanation for the quicker destruction of the lamp when it is switched on at the selected over-run voltage, is that when the filament is cold, its resistance is many times lower than when it is burning, and therefore there is a momentary surge of a heavy current which will destroy the filament very much more quickly.

The same fact is stressed by Gronostayski in his article previously mentioned, in which he points out its relation to the necessity for running projector lamps at their correct voltage, particularly as the normal rated life is only about 25 hours. For this reason, some form of voltage regulation should always be provided on machines provided with lamps of very high wattage and closely bunched filaments. When the fact that the mains voltage may vary as much as 10 or 15 per cent. is realised, the need for some form of control becomes very obvious.

During the investigation it was noticed that as the applied voltage on the lamp was raised there was an apparent change in the colour value of the emitted light. In order to determine whether this was a visual illusion or a physical fact, the following simple experiment was devised. A lamp was suspended over a Weston Lightometer, over the cell of which filters could be placed. The filters used were those in the Ilford Tri-colour set, so that an approximation could be obtained of the amount of light emitted in three regions of the

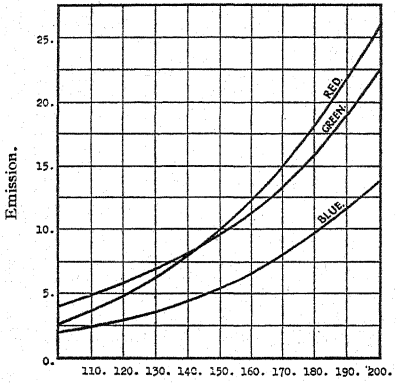


Fig. 6.

spectrum passed by these filters. The three curves in Fig. 6, are obtained from the readings from the experiment, due allowances being made for the different sensitivity of the cell in the different regions of the spectrum. Even from this approximation it will be seen that the spectral composition of the emitted light varies with the rise in voltage. The curves diverge with greater rapidity as the voltage is increased above normal. In contradiction to popular belief, the emission in the red region increases most and in the blue least. This at once accounts for the recommended use of a relatively deep blue filter in colour work by this type of artificial lighting. It must be appreciated, therefore, that the actual over-run voltage is a fairly critical factor in colour work, and a selected filter will only be correct over a relatively small voltage range.

Another factor which must be taken into consideration when there is any question of standardising exposures by the light from lamps run under conditions of an applied voltage above normal, is that of deterioration and loss of output with age. The emission from a metal-filament gas-filled lamp drops towards the end of its life whatever the voltage applied to the lamp may be ; but, whereas this drop may be considerable in the case of a lamp run at normal voltage the drop becomes negligible when the lamp is run at voltages over 60 per cent. above normal. The maximum recorded drop in light output has not been greater than 10 per cent. over a two hours continuous burning test.

Although the work done has provided a certain measure of interesting information, there is obviously room for further investigation into the characteristics of over-run lamps. More accurate measurements of the light output in a greater number of separate regions of the spectrum would be of use in enabling filters to be selected for various types of photographic work. We are indebted to Messrs. Richards and Bright for the facilities for carrying out this work.

THE PATENTING OF INVENTIONS.

By H. T. P. GEE.

This short article deals only with the salient points relating to the patenting of inventions and avoids, as far as possible, technical and legal aspects of the matter.

WARNING.

Except in certain circumstances, public disclosure of the invention prior to applying for a Patent is a ground on which the Patent can be invalidated. There should be no undue delay in applying for the Patent as, excepting in certain cases, the person who first applies for the Patent is, according to British Patent Law, entitled to it even though he may not be the first inventor.

WHAT MAY, AND WHAT MAY NOT, BE PATENTED.

Inventions which are a "manner of manufacture" and which possess novelty and utility are patentable. Such inventions may relate, for example, to machines and appliances, combinations of parts, and improvements upon them; processes or methods of manufacture and improvements on them; and the application of a known machine, etc., to a new purpose if the application requires "invention."

In regard to substances prepared or produced by chemical processes the substance itself cannot validly be patented except when prepared or produced by the methods or processes of manufacture particularly described and ascertained in the specification or by their obvious chemical equivalents.

As regards inventions relating to munitions of war, inventors are advised to keep them secret and, after protecting them, to submit them to the appropriate Government department for consideration.

Patent applications are not accepted for alleged inventions:

in which the only material product realised is a printed sheet or its equivalent for use in carrying out some scheme of business or the like;

which are so obviously contrary to well-established natural laws that the application is frivolous;

which in use would be contrary to law or morality.

How to Apply for a Patent.

The application can be made either with a Provisional Specification or with a Complete Specification. If a Provisional Specification is filed and a full Patent is desired, the Complete Specification must be filed within 12 months from the application date (or within 13 months on payment of an extension fee). If no Complete Specification is filed, the Patent Office does not publish the Provisional Specification.

The majority of Patent Applications are accompanied by a Provisional Specification because the initial cost is smaller, the invention can be protected quickly, and an opportunity is given to devise improvements which may, in suitable cases, be incorporated in the Complete Specification.

If, however, the invention is fully developed, then it is advisable to apply with a Complete Specification in the first instance.

Models are not required by the Patent Office, but, in the inventor's interest, it is often advisable to make one because, in doing so, improvements may suggest themselves which may be incorporated in the Patent Specification. As against this advantage, however, there is the disadvantage that delay may result in the inventor being forestalled by another inventor applying for a Patent. Therefore, in cases where delay is likely to prove dangerous, the inventor should apply for a Patent without undue delay, and if, in making up a model or in otherwise developing the invention, it is found that the original specification does not fully cover the invention he may file a further specification, or further specifications and, in suitable cases, a single Patent based on all these specifications may be obtained.

There is an idea held by many inventors that a Provisional Specification does not require any particular care in its preparation. This is a mistaken notion often leading to trouble in the later stages of obtaining a Patent and sometimes resulting in the loss of the date of the original Application. The loss of such date may render the Patent invalid by reason of prior publication or prior user, perhaps by the inventor himself, or it may even enable another inventor to slip in and obtain a Patent for the same invention. It cannot, therefore, be too strongly impressed upon inventors that the Provisional Specification is an important legal document, and forms the foundation on which the Patent is to be granted.

Searching.

Inventors would generally be well advised to have a search made, at least through British Patents granted during the

preceding 50 years, before spending much time and money on their inventions. This search is advantageously made before the Patent is applied for, but if it is deemed unwise to delay protection of the invention a search can be made after the Patent is applied for.

The Patent Office does not make any search on Provisional Specifications as regards the novelty of the invention, but upon a Complete Specification being filed a search is made by the Examiner with a view to ascertaining whether the invention claimed is new. This search includes British Patent Specifications dated within 50 years preceding the new application. The Comptroller is also empowered to refer to Foreign Patent Specifications of the previous 50 years and to any other prior document of whatever age (excepting Official Patent Abridgment more than 50 years old), made available to the public by publication in the United Kingdom and coming within his knowledge. When, as a result of the search, the Examiner draws the Applicant's attention to any prior publications, the Applicant is given an opportunity of amending his specification with a view to avoiding them. This stage in the progress of an application is often a difficult one, especially for those who are not familiar with Patent practice. However, with the exercise of care and skill in such matters it is generally possible to overcome the prior publications by way of amendment. In the event of the Applicant failing to amend his specification to the Comptroller's satisfaction, the Comptroller has power to insert, in the Complete Specification, a reference to the prior publications by way of notice to the public or, if the Comptroller is satisfied that the invention claimed has been wholly and specifically claimed or described in any prior publications, he may refuse to grant a Patent.

Who May Apply for a Patent.

Any true and first inventor (or more than one) may apply for a Patent, and he or she may apply jointly with any other person or persons, including a company or a firm. The applicant may be of either British or foreign nationality.

An employee who brings out an invention, even though he may have done so in his master's time, is entitled to apply for a Patent. Further, he may be entitled to the benefit of the Patent unless this would inflict an injustice on the master in view of the relations between them such, for example, as a high salary and the confidential character of the employment, or a contract, express or implied, between them, in which cases the Patent may be obtained by the employee in trust for the employer.

If, however, the master suggests the main idea and the employee, in carrying it out, merely suggests improvements in detail, the master's name must be recited in the Patent Application as the inventor although he may, if he so desires, add the employee's name to his own. If the master and servant have jointly produced the invention, both of their names must be recited in the Patent Application, and, if the master is to receive the sole benefit of the Patent, it can be arranged for the Patent to be granted to him alone.

In cases where financial or other assistance has been rendered by a Capitalist, Employer, etc., the Patent is often applied for in the joint names of the parties interested. In such cases it is advisable that a written agreement be entered into in order clearly to define the rights of the parties.

The legal representatives of a deceased inventor may apply for a Patent.

A Patent may be applied for by a person to whom an invention has been communicated from abroad, and an assignment to the communicator can subsequently be effected, or arrangements can be made to have the patent granted to the communicator.

An importer of an invention from abroad may, in certain cases, apply for and obtain a Patent.

Post-Dating of Applications.

For various reasons, an applicant may find it desirable or necessary to post-date his application, *e.g.*, when he wishes to defer incurring the expense of his Complete Specification, or when he wishes to delay publication of his specification or, again, when he wishes to gain time for applying for patents abroad. He may, therefore, on payment of the prescribed fee and before the acceptance of his Complete Specification, make a request for the post-dating of his application to a date not later than six months from his application date. If only a Provisional Specification has been filed, such request must be made within twelve months or, with extension fee, within thriteen months from the application date. Inventors should, however, before deciding to make such a request, bear in mind the risks, as explained above, involved in the loss of the original date.

Acceptance (Publication) of Complete Specification.

If the official objections (if any) are not overcome and the Complete Specification accepted within 18 months (or, with extension fee 19, 20 or 21 months) from the application date, the application becomes void, excepting in special circumstances.

Opposition to the Grant of a Patent.

The acceptance of the Complete Specification is advertised in the Official Patents Journal and, at any time within two months (or, in certain circumstances, three months with extension fee) from the date of such advertisement, any person may give notice of oppsition to the grant of a Patent, on certain grounds.

The opponent must state fully the nature of his interest, the facts upon which he bases his case and the relief which he seeks.

If the applicant is desirous of contesting the opposition, he must lodge a counter-statement. Subsequently the opponent and the applicant may lodge evidence in support of their respective cases, and the Comptroller appoints a hearing, at which the parties may attend to argue the case, and gives his decision in due course. An appeal against his decision can be taken to the Appeal Tribunal.

Sealing of a Patent.

Except in certain circumstances, including cases of opposition, of appeal to the Appeal Tribunal, or of the applicant's death, a Patent must be sealed within 21 months from the application date, or within 25 months from such date if an extension of time has been obtained for leaving or accepting the Complete Specification, but an extension of time up to three months beyond the normal limit may be applied for on payment of the prescribed fee.

If the Comptroller is satisfied that the sealing of the Patent would inflict hardship in connection with an applicant's Patent application abroad, he may extend the sealing period on payment of extension fees. This is a very useful provision in connection with belated Patent applications in the U.S.A. and Canada, as, it may be useful to explain, a U.S.A. or Canadian Patent for the same invention will be invalid if it is applied for after one year from the foreign application and is granted after the foreign patent is granted.

Marking of Patented Articles.

Patented articles should be marked with the word " Patent " or " Patented " accompanied by the number of the Patent. If this is not done the Patentee may, in certain cases, be debarred from obtaining damages for infringement, although he may obtain an injunction restraining infringement. Care should, however, be exercised where an article marked " Patented " is exported to a country where in fact no Patent has been obtained, as in some cases—notably South Africa

and the Irish Free State—difficulties may be encountered or the importation may be prohibited. Until such time as the Patent is granted, it is desirable to mark articles made in accordance with an application for a Patent with the words "Patent applied for" or "Pat. app." but it is not wise to give also the number of the application.

Territory Covered by Patent.

A Patent covers the United Kingdom of Great Britain and Northern Ireland and the Isle of Man. If protection is required in the Channel Islands and the Irish Free State, separate applications have to be made in those territories.

Joint Ownership.

The Patents etc. Act provides that "where . . . a patent is granted to two or more persons jointly, they shall, unless otherwise specified in the Patent, be treated for the purpose of the devolution of the legal interests therein as joint tenants, but, subject to any contract to the contrary, each of such persons shall be entitled to use the invention for his own profit without accounting to the others, but shall not be entitled to grant a licence otherwise than with their consent or in accordance with directions given by the Comptroller, and, if any such person dies, his beneficial interest in the Patent shall devolve on his personal representatives as part of his personal estate." It is, however, open to any one or more of joint patentees to apply to the Comptroller for directions as to the sale or lease of the patent, or as to the use and development of rights or the grant of a licence thereunder, and to request that an Order may be made giving such directions.

Patents of Addition.

These may be applied for in respect of improvements in or modifications of an invention. They are granted for the unexpired term of the original Patent and are not subject to the payment of renewal fees. A patent of addition may be applied for only by the Patentee ("Patentee" includes the subsequent registered proprietor of a Patent), in the case of a granted Patent or by the applicant in the case of a pending application.

An independent Patent for an improvement in or modification of an original invention may be converted into a Patent of addition.

COLOUR SEPARATION NEGATIVES.

By D. A. Spencer, Ph.D., D.I.C., F.R.P.S.

Technical Director, Colour Photographs (B. & F.) Limited.

In a few years' time the professional photographer who cannot make a first class set of separation negatives will be as out of date as one who cannot handle panchromatic material is to-day.

In the Technical Section of this Almanac there have this year been included for the first time full instructions for the making of colour separation negatives. The necessary information is given in as condensed a form as is possible and may therefore prove a little misleading to experienced monochrome workers who are only too familiar with the liberties which may safely be taken in interpreting instructions for black-and-white photography. In these directions *every sentence and every adjective is important.* Phrases such as "Fresh developer" or "Rocking out of phase throughout the whole development time" must be taken absolutely literally because in colour work one is working along a knife edge at every stage from the exposure to the assembly of the finished print, and tolerances permissible in monochrome simply do not exist. If a monochrome flesh tint is rendered 10 per cent. darker than it should be, no one will ever know the fact, but 10 per cent. of unwanted blue in a flesh tint will convert it to a corpse-like pallor, and so it comes about that negatives which may be ideal for a monochrome photograph may produce polychromatic monstrosities when printed in colour.

It is a waste of time, money and material to take endless pains in the arrangement, lighting and exposure of the subject if the negatives are to be developed under the conditions normally obtaining in a monochrome photographer's darkroom, and it is a curious fact that a beginner is more likely to produce a perfectly satisfactory set of separation negatives than is an old hand, new to colour work. This may be ascribed entirely to the fact that the tyro approaches the task in ignorance of any other method of working!

It is safe to say that 75 per cent. of those who now make excellent separation negatives would have achieved their present standard of workmanship in the first week had they religiously followed these instructions instead of putting them aside with the unspoken comment, "I know all that!"

THE ILLUSTRATIONS

The following is a list of the reproductions arranged in the order in which they appear in the book.

MURIEL SEWELL (London).—The Optimist.

E. RONALD SLEEP (Newton Abbot).—Disputed Possession.

NOEL GRIGGS (Studio Briggs, London).—Still Life.

NOEL GRIGGS (Studio Briggs, London).—Nude.

KENNETH N. CROWE (Reading).—We Two.

BERNARD ALFIERI, JUN. (Surbiton).—Old Friend.

KEITH DANNATT (Surbiton).—Bubbles.

G. L. HAWKINS (Oxford).—Upland Ploughing.

EDWIN BROOMER (Torquay).—Decorative Panel.

WALTER BIRD (London).—Aphrodite.

JETTE BANG (Copenhagen).—Weeping Greenland Child.

ARCHIE HANDFORD (Croydon).—Discovery.

KOLLAR (Paris).—Advertiseing Study.

W. G. BRIGGS (Studio Briggs, London).—Tears.

A. B. DE LA VERGNE (Denver).—Composition.

LEONARD MISONNE (Gilly).—Etude de Ciel.

J. V. DORIN (Chicago).—Opal.

PAUL SHILLABEER (London).—Michael.

W. FOSTER BRIGHAM (Bridlington).—The Make-up Man.

CHALONER WOODS (London).—Fandango.

R. N. HAILE (Bognor Regis).—Miss Sarah Churchill.

MARCUS ADAMS (London).—The Problem.

WALDEN HAMMOND (Leamington Spa).—Repoussée.

ANGUS BASIL (London.)—Silver and Gold.

DOROTHY WILDING (London).—Summer Drinks.

ARCHIE HANDFORD (Croydon).—The Old Clown.

PAT LIVERIGHT (New Jersey).—Bath for Beulah.

RICHARD N. SPEAIGHT (London).—Profile.

J. W. MOORE (Durban).—A Zulu Beau Brummell.

THOMAS FALL (London).—No Leavings.

YVONNE (London).—Atalanta.

DOUGLAS (London).—Ivegottanorse.

CHALONER WOODS (London).—The Fatalist.

B. A. BUTT (St. Ives).—Gulls.

ELLIOTT AND FRY (London).—Val Gielgud.

ALICE KENYON (Filey).—Bored.

JULIAN SMITH (Melbourne).—Dick Swiveller.

B. L. BLINKHORN (Evesham).—Got Him!

MARCUS ADAMS (London).—The Mighty Mite.
PAUL SHILLABEER (London).—High Jinks.
K. REITZ (Wembley).—Peacock.
JOHN H. AHERN (London).—Satiation.
NOEL GRIGGS (Studio Briggs, London).—Mrs. King of Hitchin.
GILBERT ADAMS (Reading).—Dressing.
L. W. OFFORD (Brighton).—Evening Sunshine.
J. E. HALL (Olton).—Binham.
P. B. ABERY (Builth Wells).—Frost.
R. N. HAILE (Bognor Regis).—The Shawl.
BOB LEAVITT (Brooklyn).—Polidor the Clown.
MARY E. WATTS (Whitley Bay).—The Water Sprite.
DONALD S. HERBERT (Weymouth).—Two Men on a Rope.
JOHN ERITH (Croydon).—Romany Child.
ROSALIND MAINGOT (London).—Masquerade.
ROSALIND MAINGOT (London).—Lorelei.
KEITH DANNATT (Surbiton).—Youth and Age.
NORMAN A. SQUIRE (Kingsbury).—Speech!
PETER PITT (London).—Harnessing the Electron.
GEORGE L. WAKEFIELD (Northampton).—Wristwatch Escapement.
S. STACEY (Skipton).—The Nudist.
JOAN MUSPRATT (Swanage).—The Summer Holiday.
J. C. H. BALMAIN (North Berwick).—The Human Peacock.
L. A. LEIGH (London).—The Water Drinker.
JULIAN SMITH (Melbourne).—The Picture Hunter.



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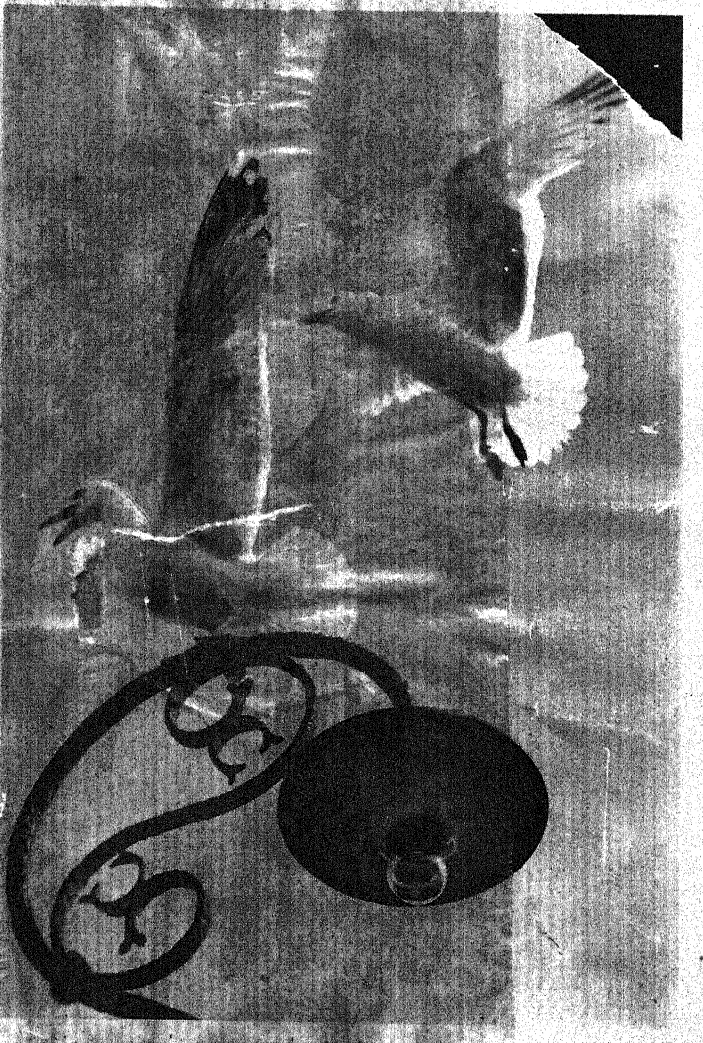
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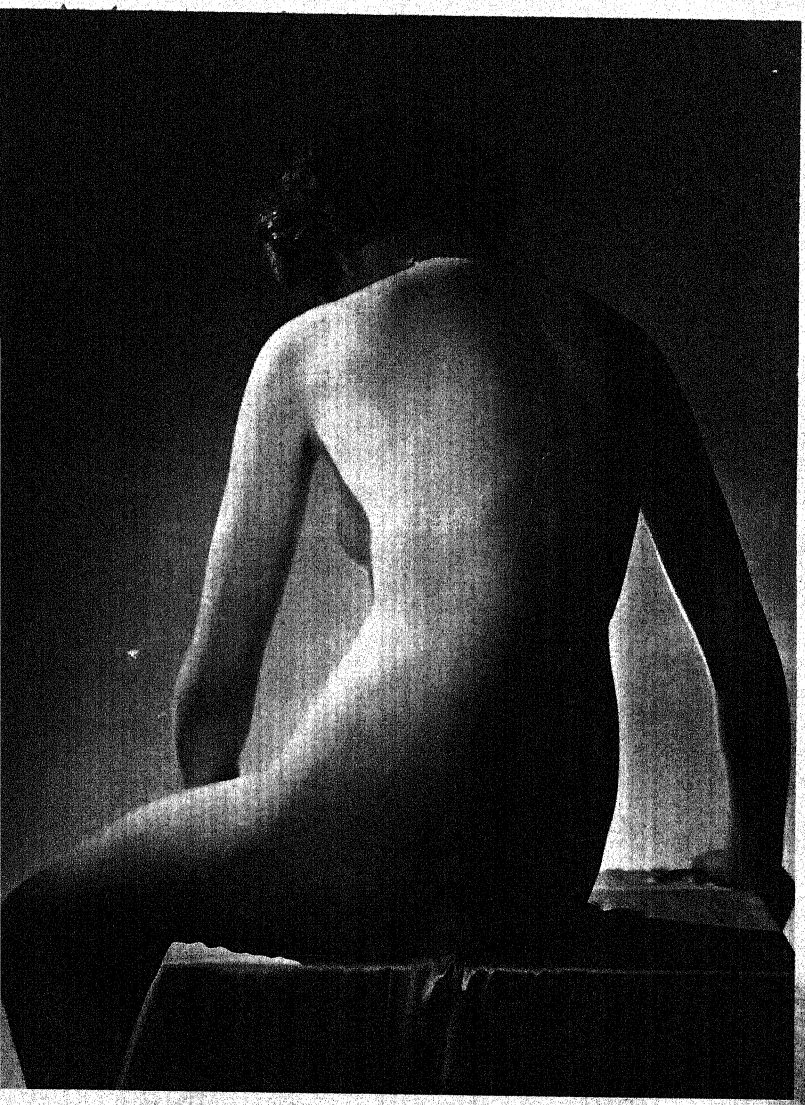
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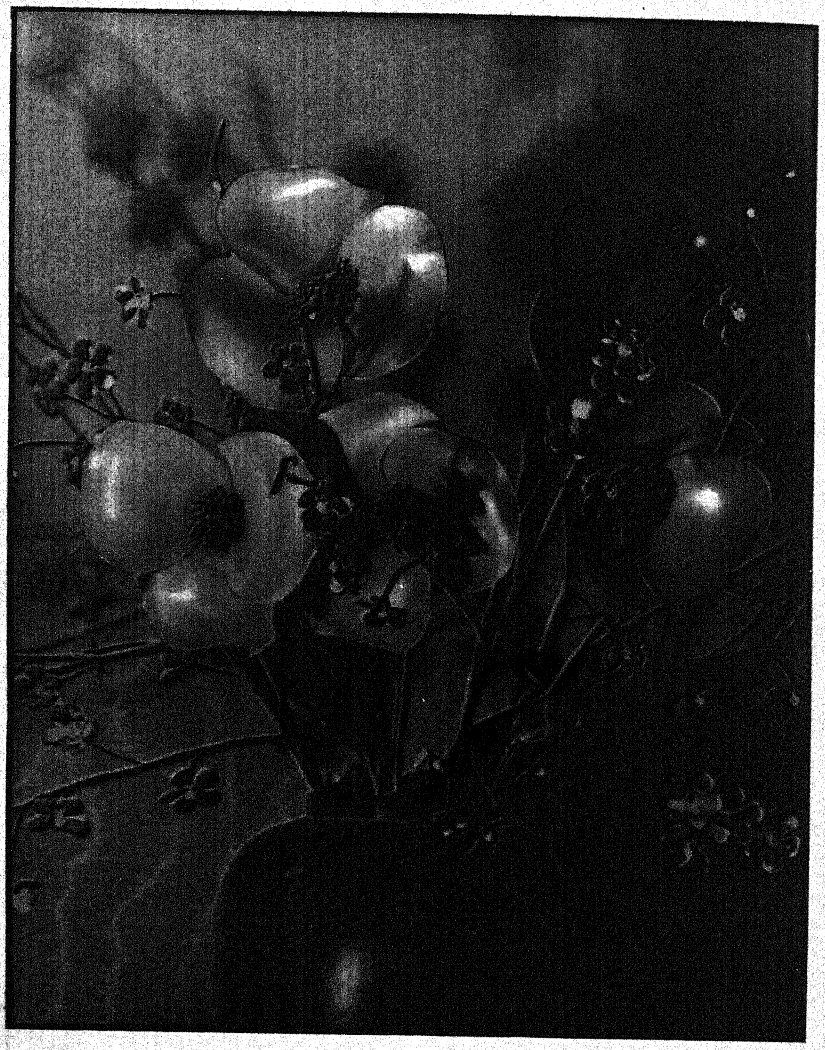
E. RONALD SLEEP



TILL LIFE

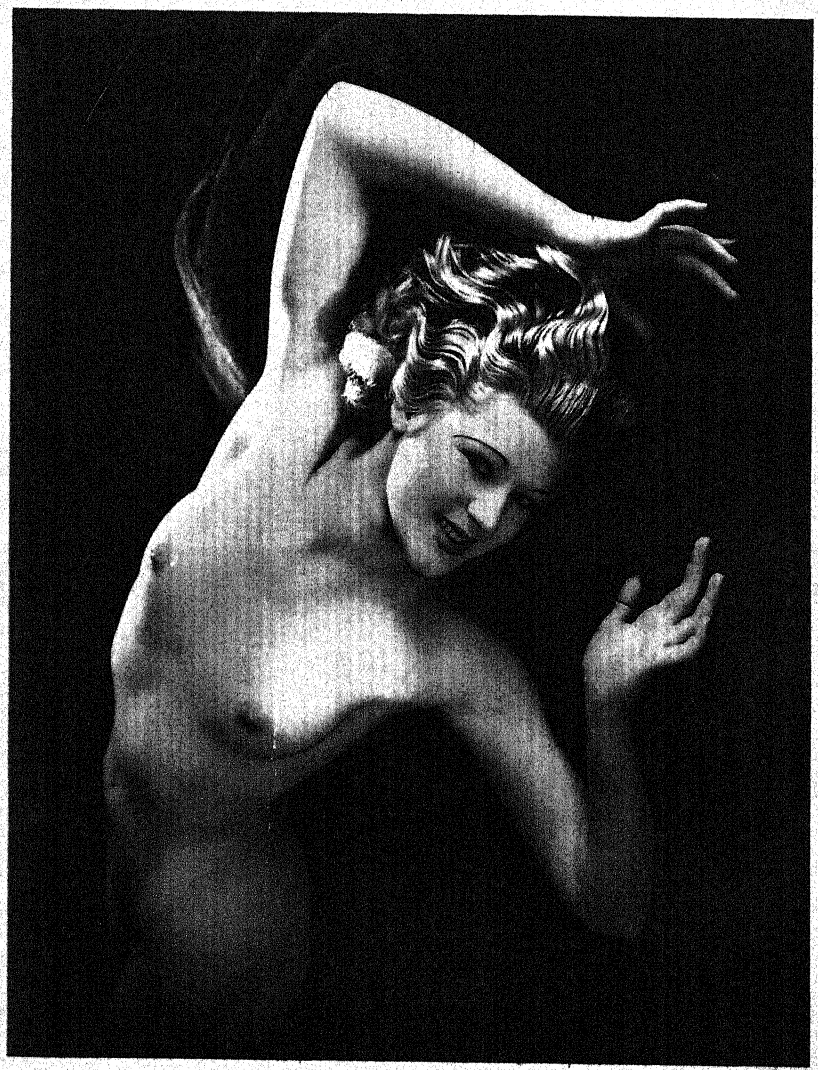
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(Studio Briggs)





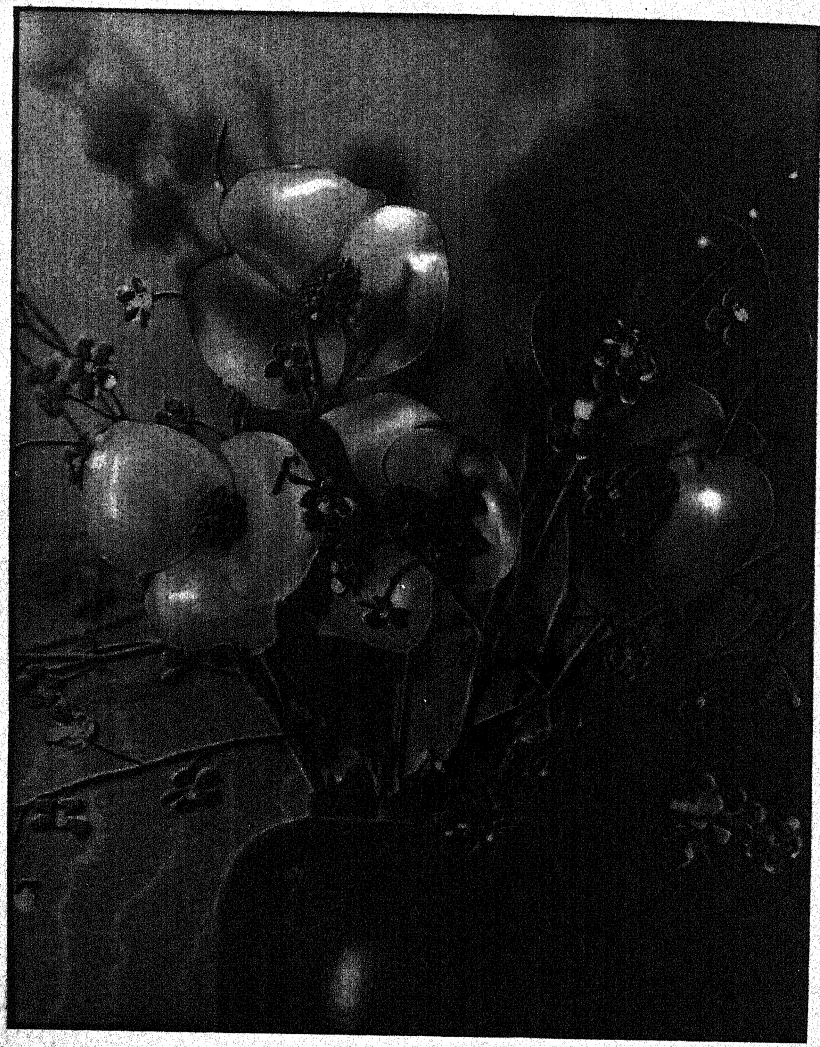
DECORATIVE PANEL

EDWIN BROOMER



APHRODITE

WALTER BIRD



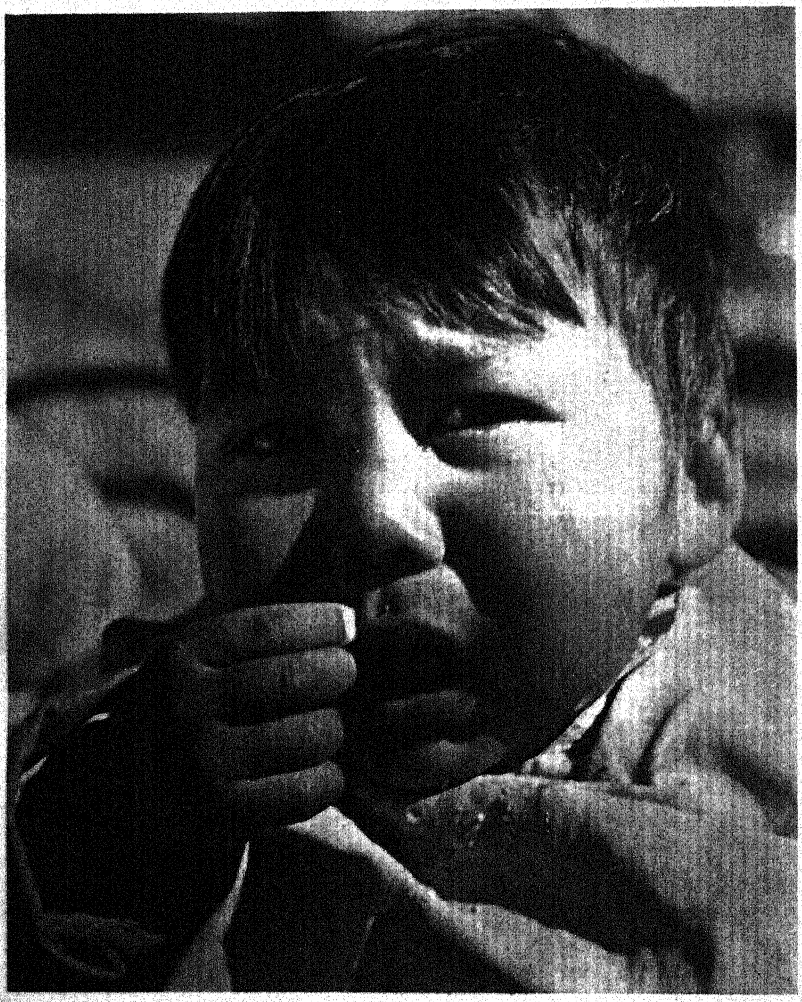
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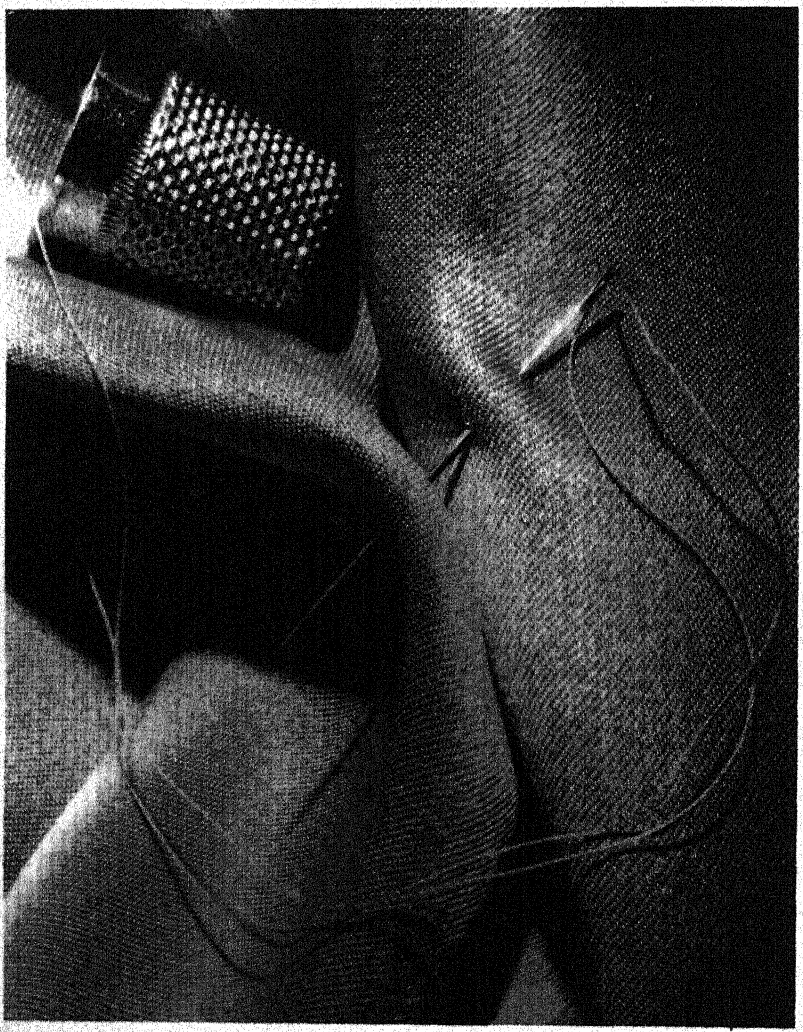
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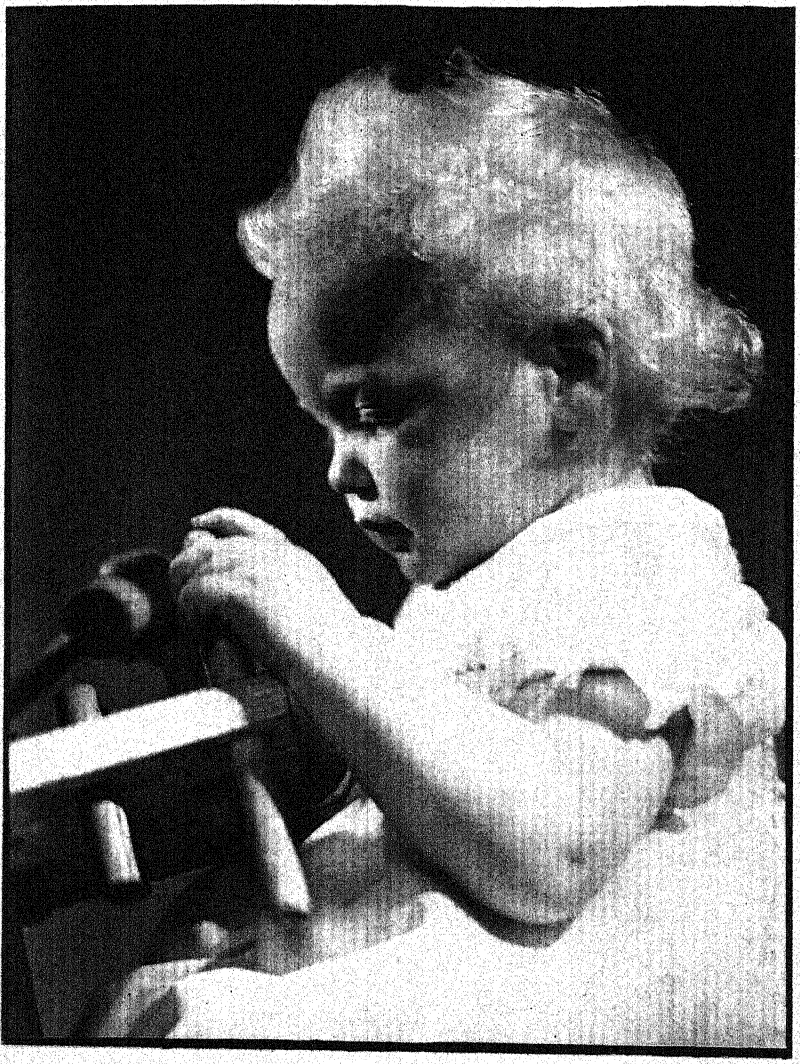


WEEPING GREENLAND CHILD JETTE BANG





ADVERTISING STUDY KOLLAR



MICHAEL

PAUL SHILLABEER







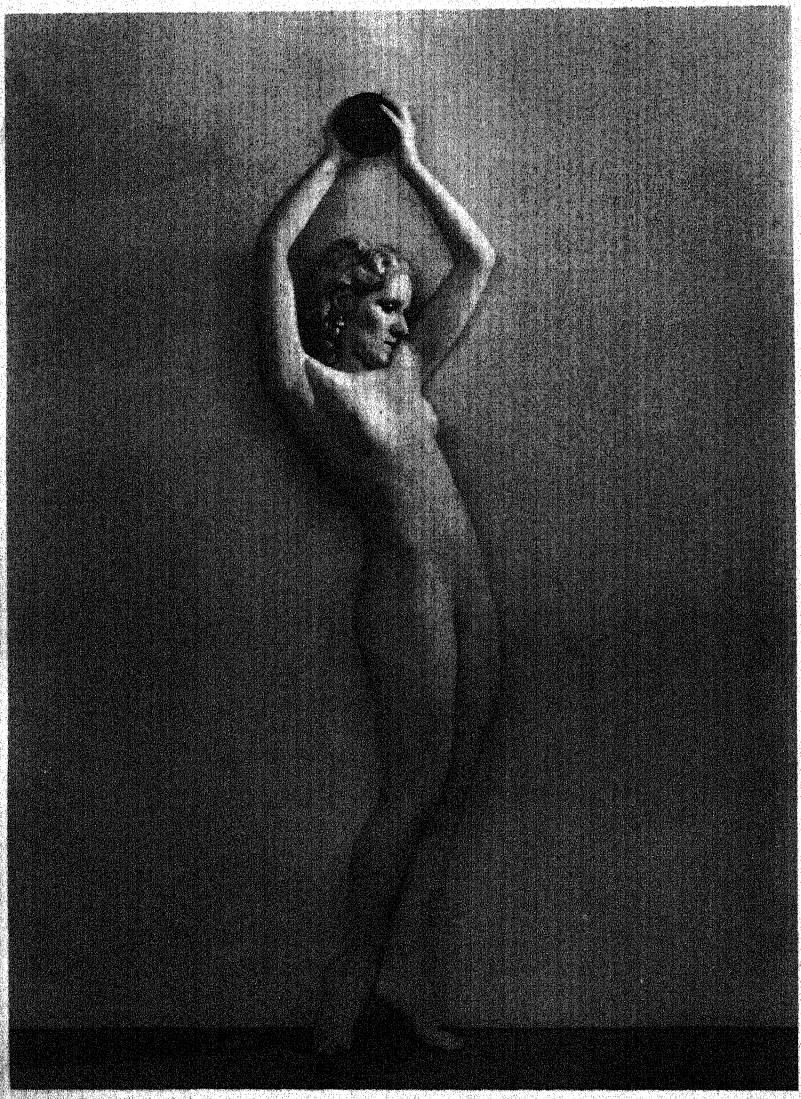
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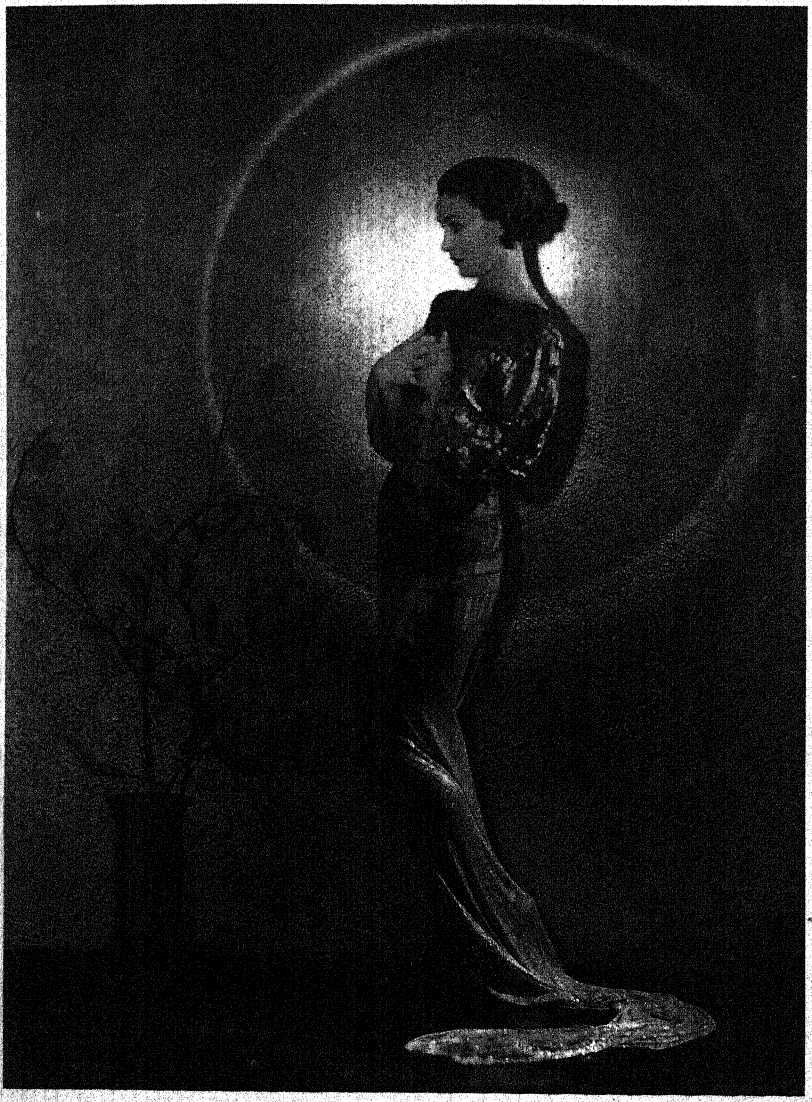
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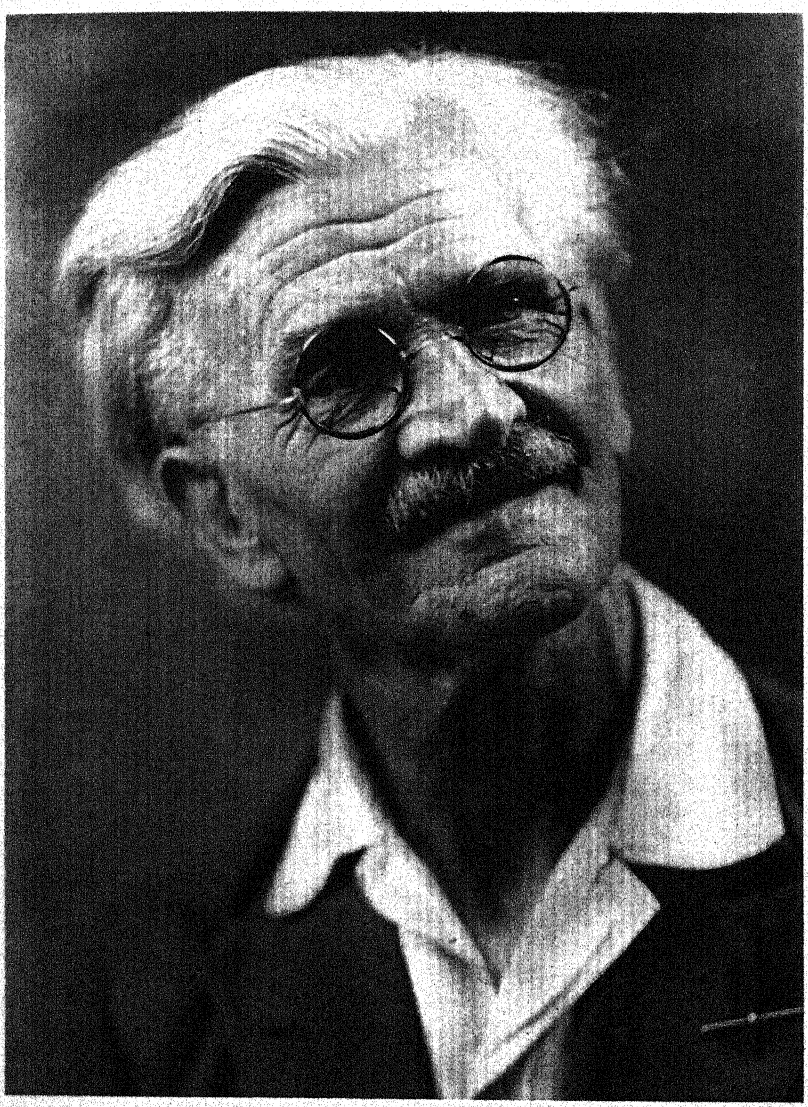
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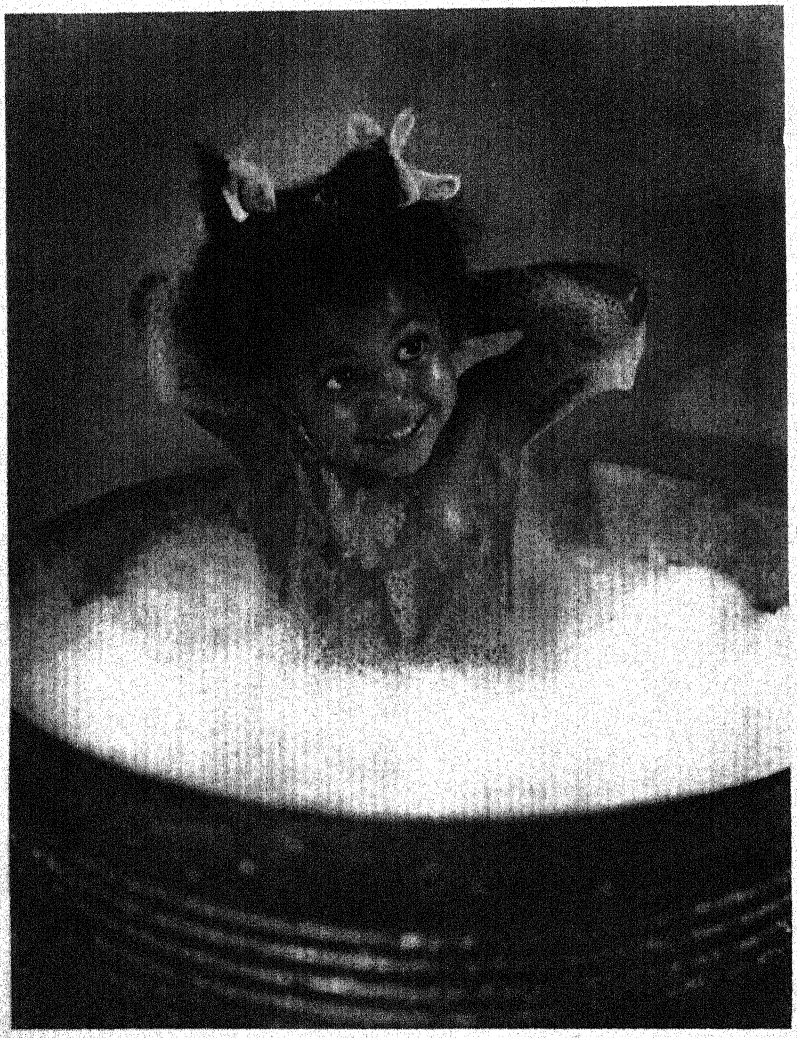
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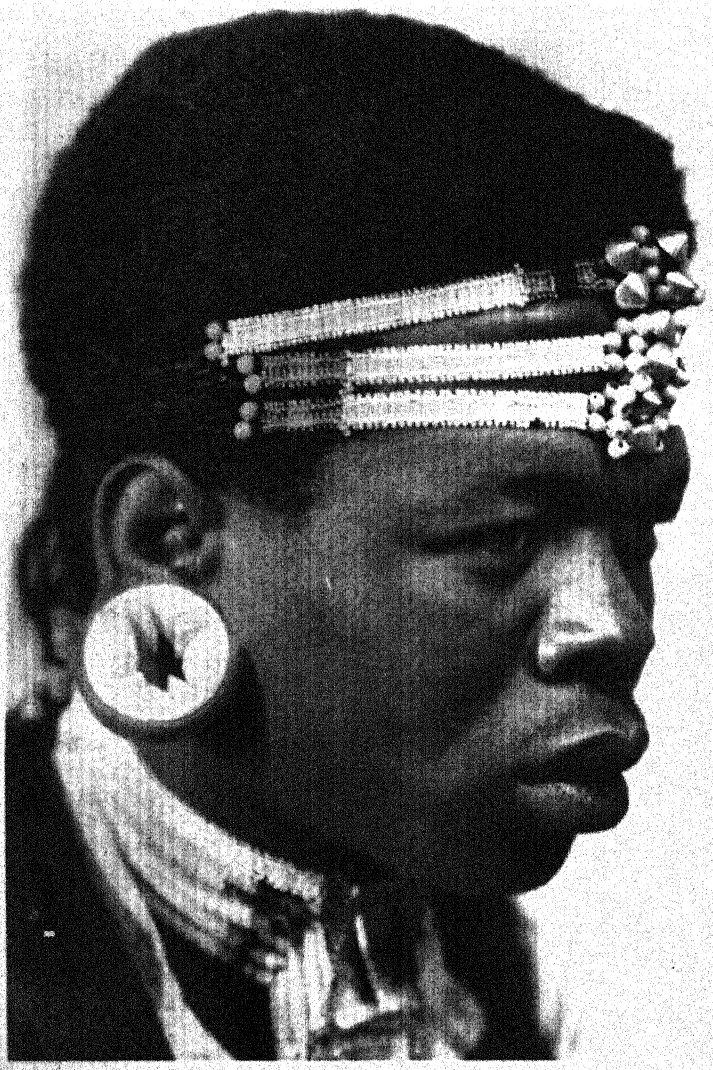


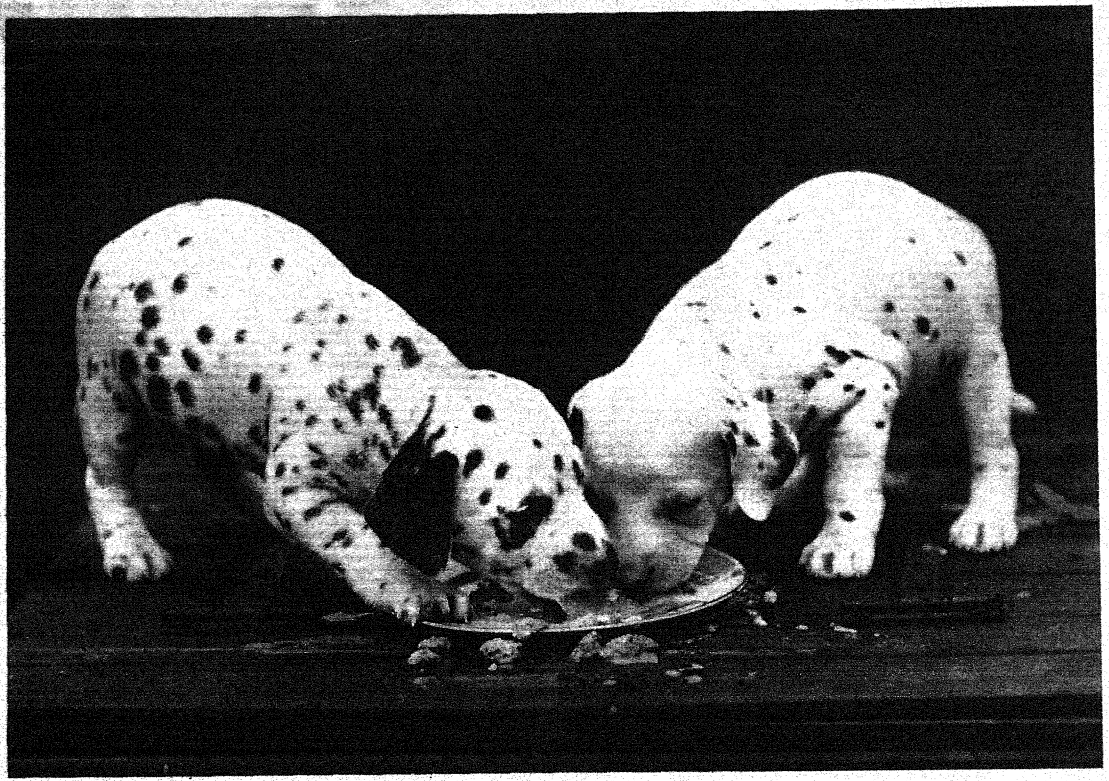
BATH FOR BEULAH PAT LIVERIGHT



PROFILE

RICHARD N. SPEAIGHT





NO LEAVINGS

THOMAS FALL



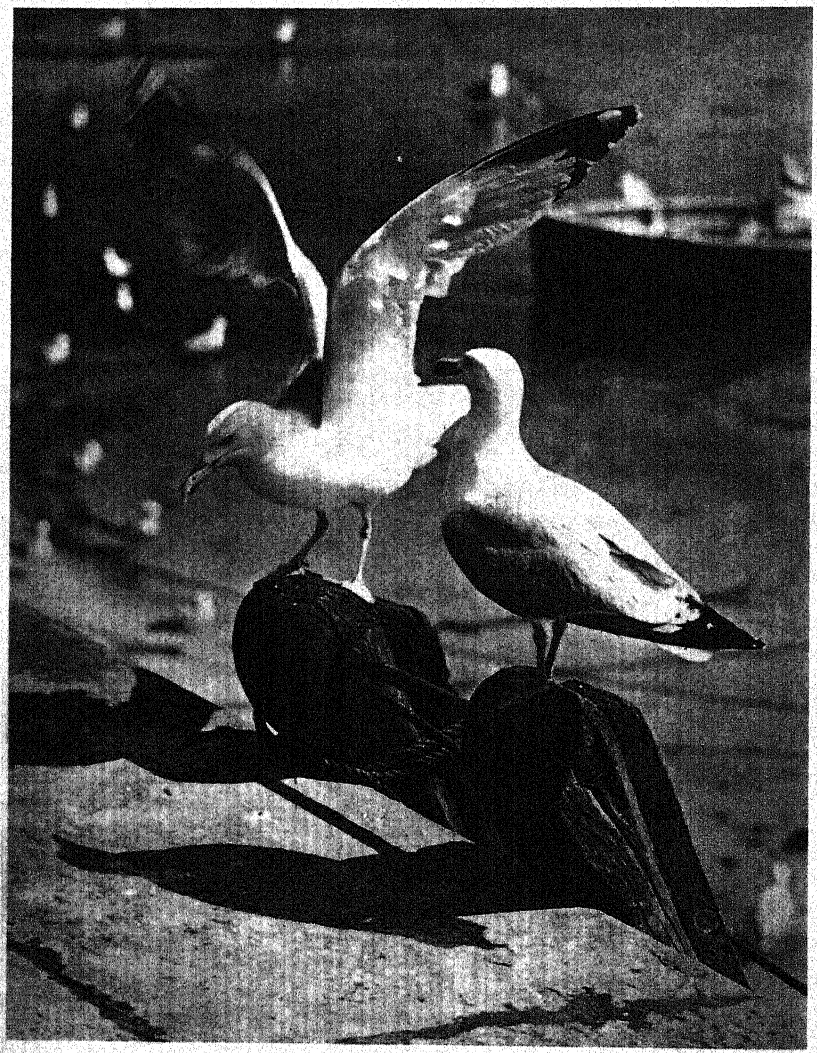
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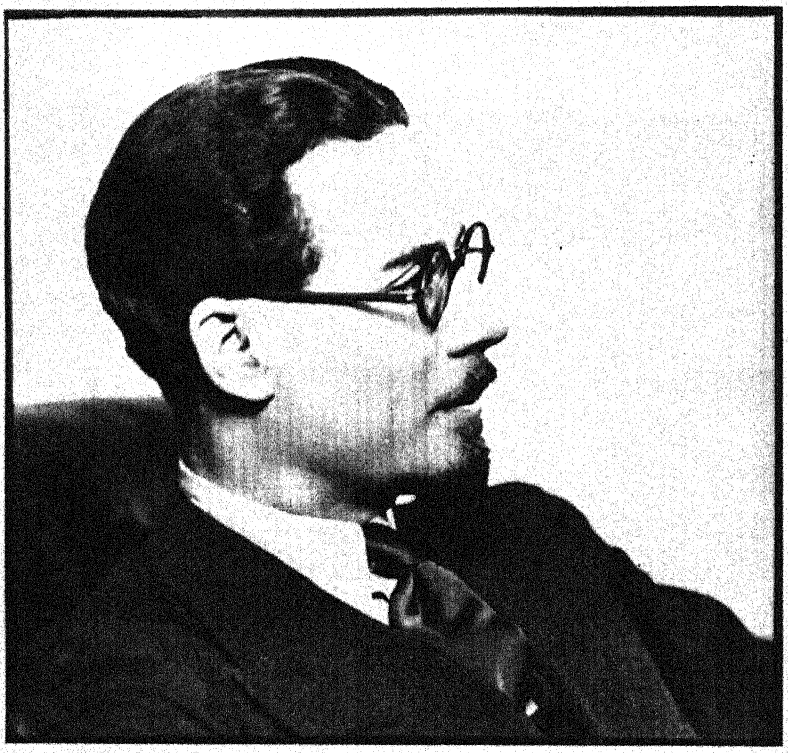


THE FATALIST



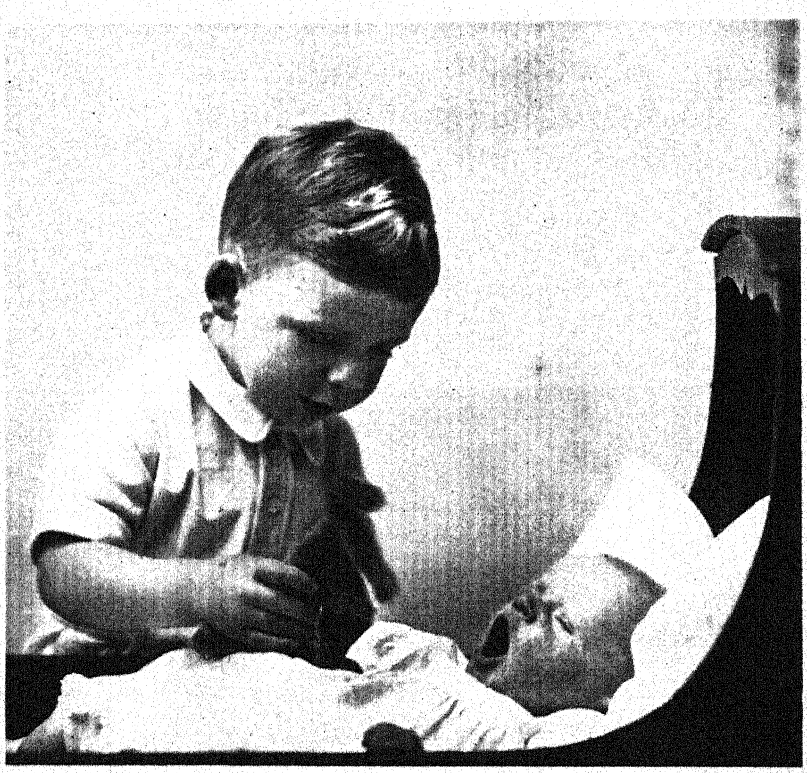
GULLS

B. A. BUTT



VAL GIELGUD

ELLIOTT & FRY

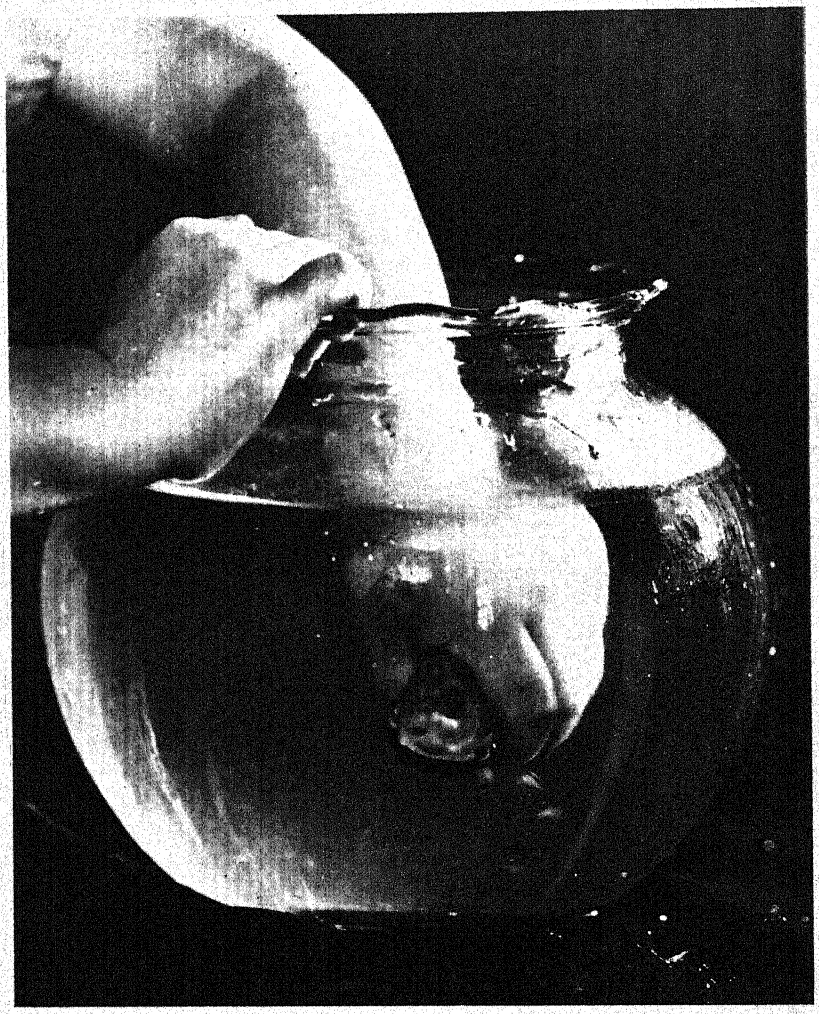


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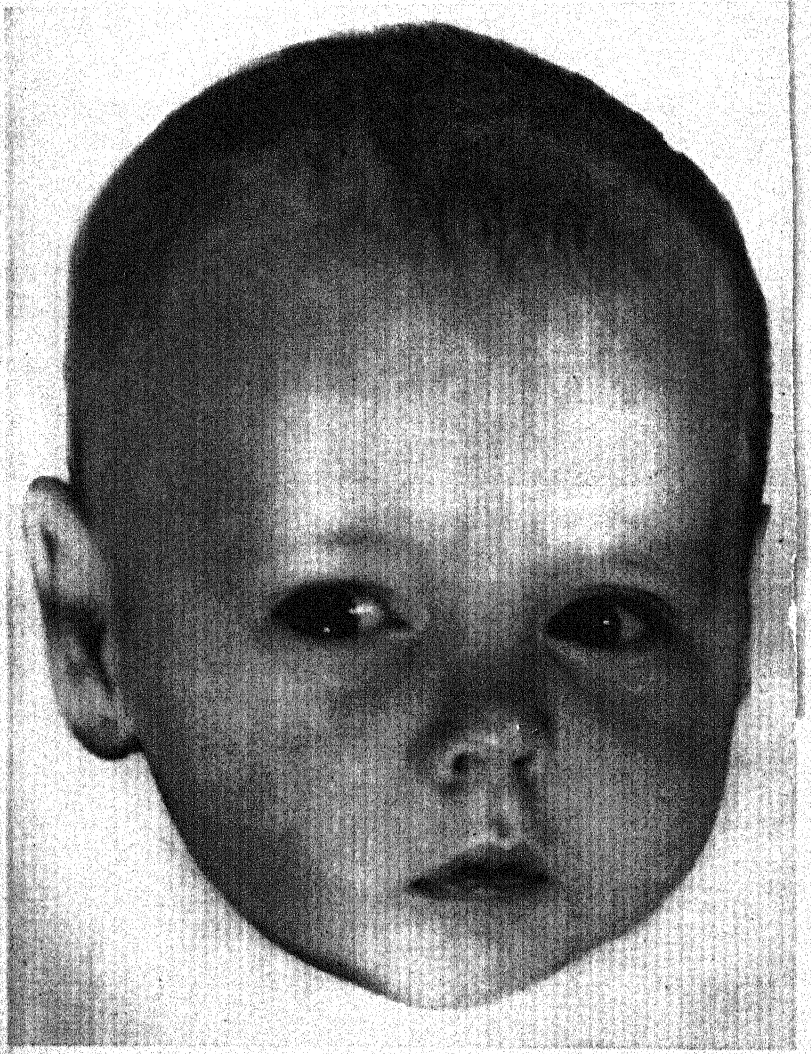
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DICK SWIVELLER JULIAN SMITH

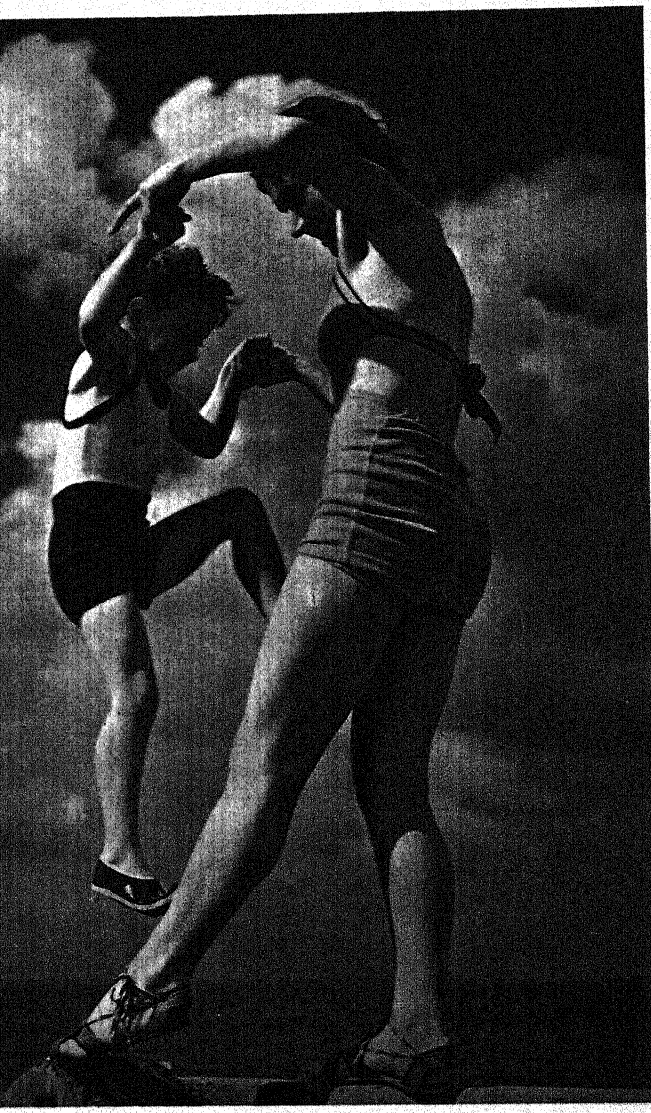


GOT HIM ! B. L. BLINKHORN



THE MIGHTY MITE

MARCUS ADAMS



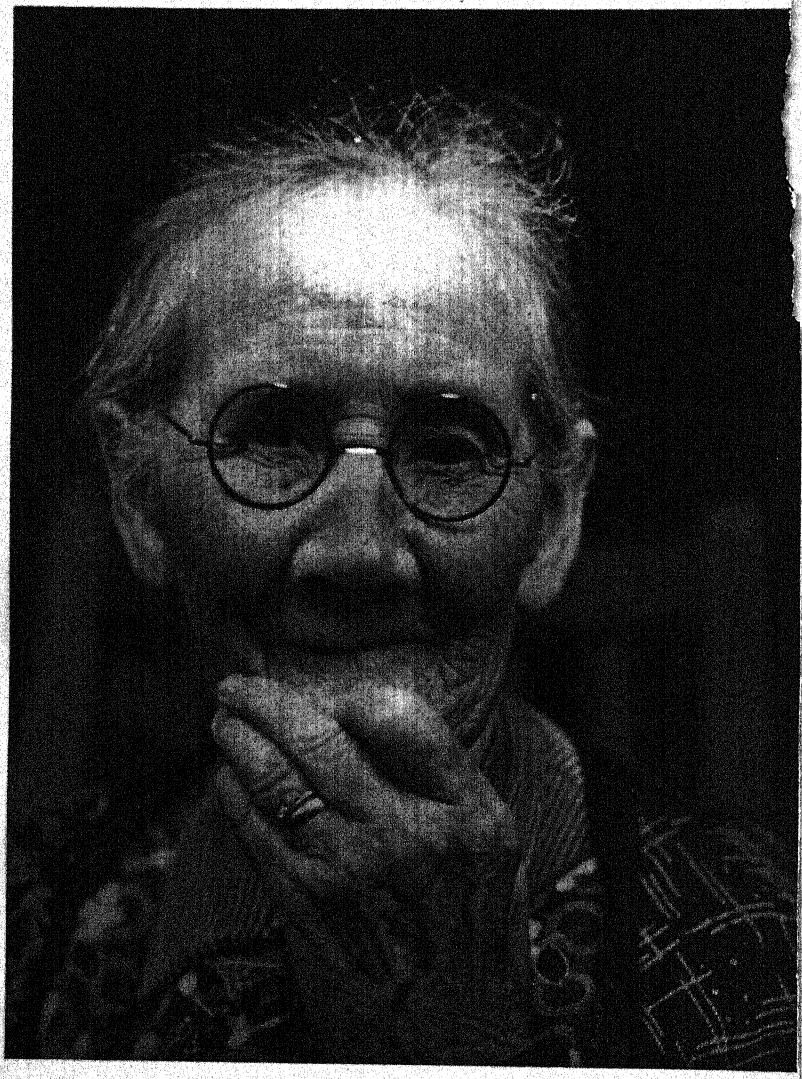


PEACOCK K. REITZ



SATIATION

JOHN H. AHERN

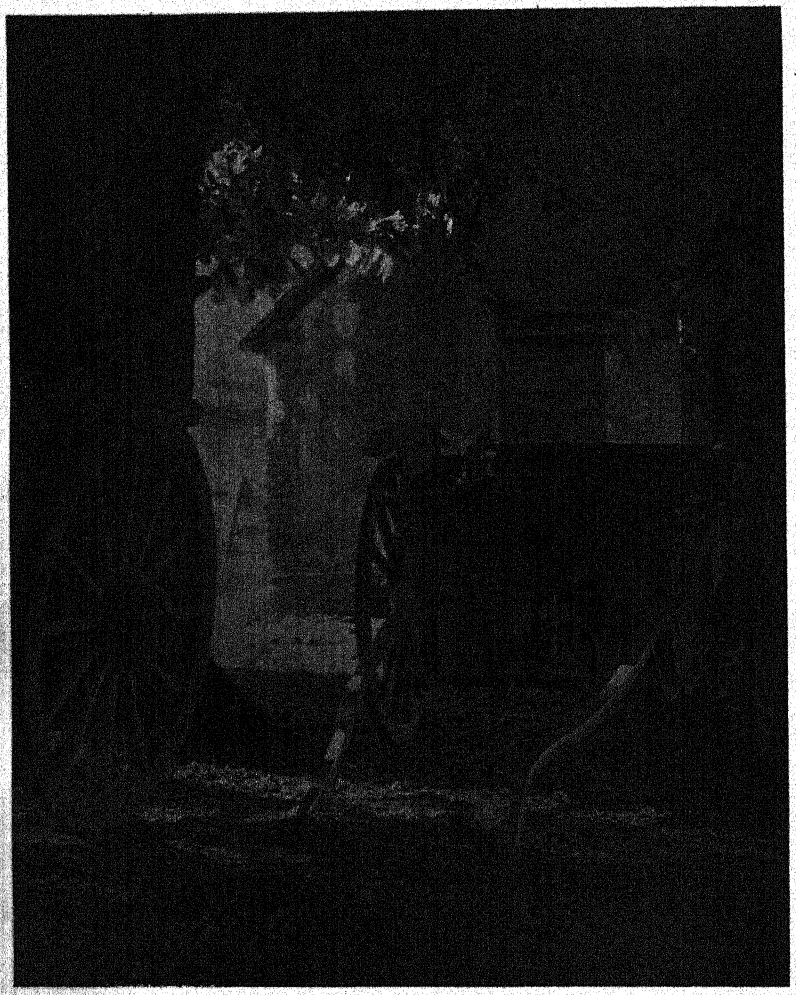


MRS. KING OF HITCHIN

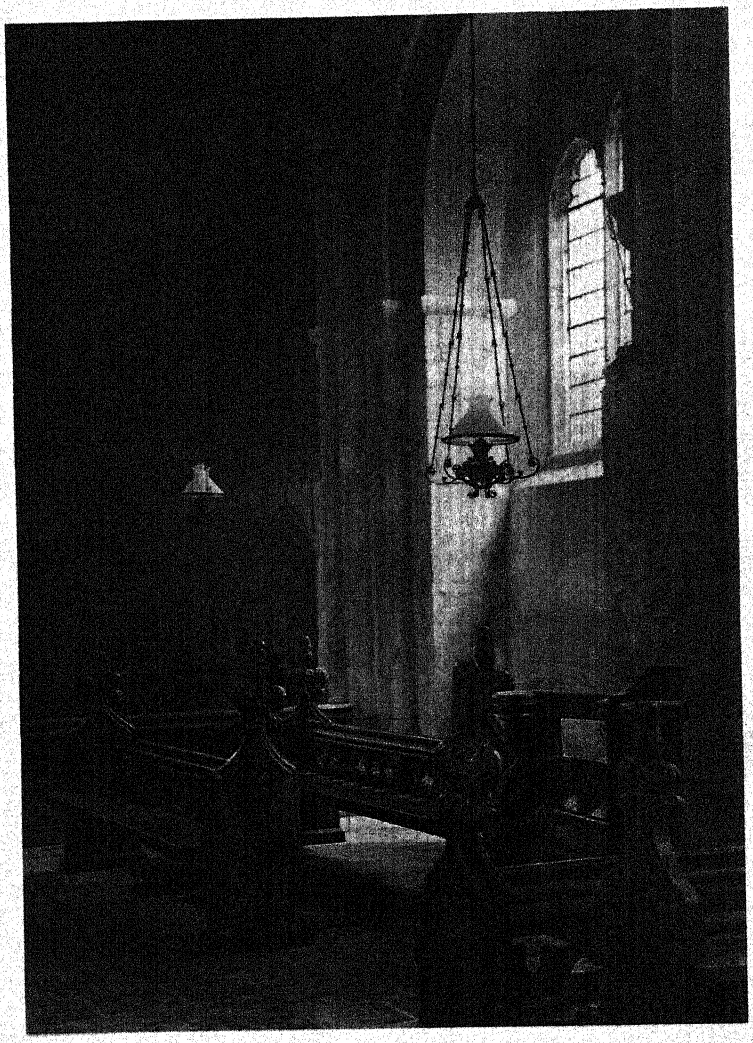


DRESSING

GILBERT ADAMS



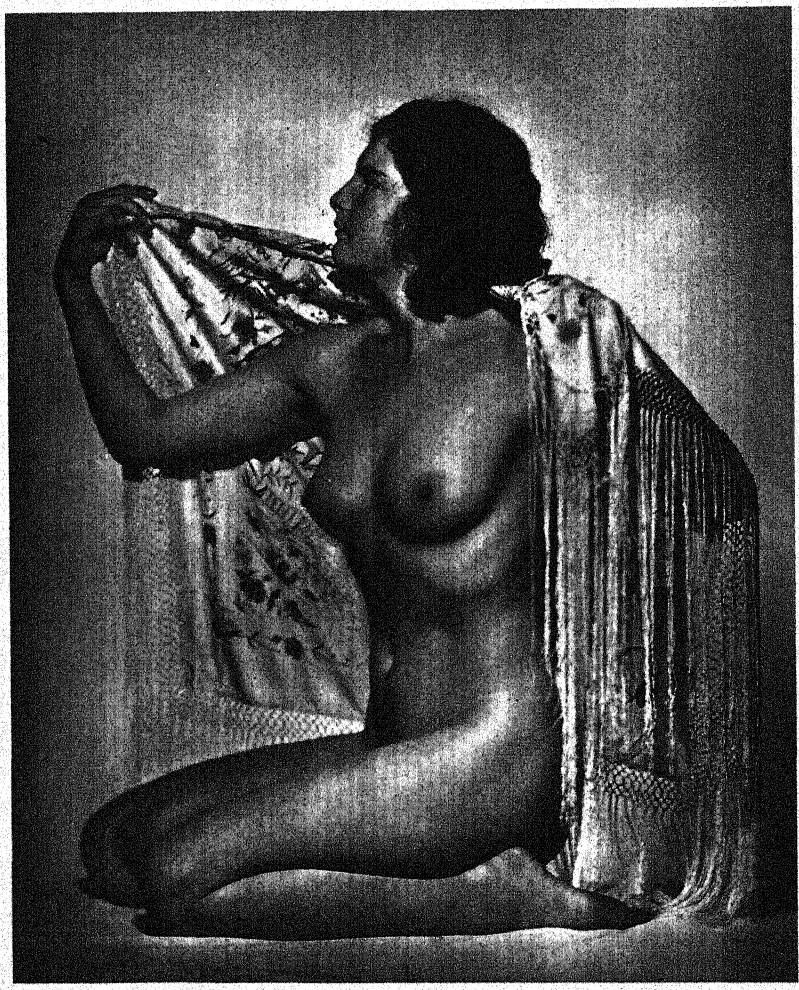
EVENING SUNSHINE L. W. OFFORD



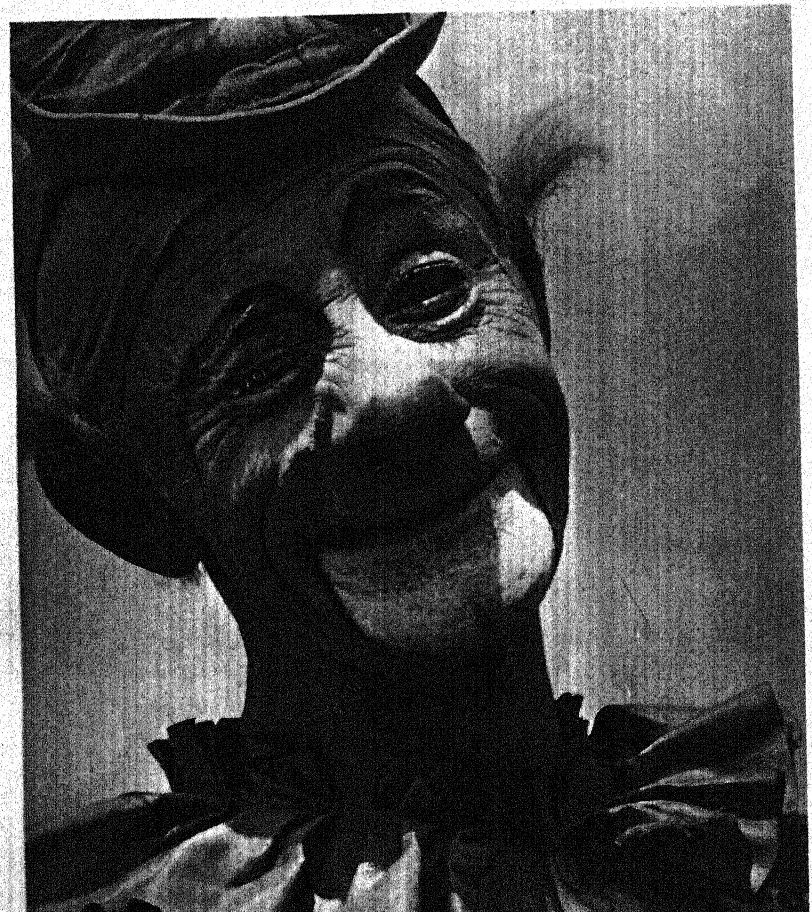
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J. E. HALL

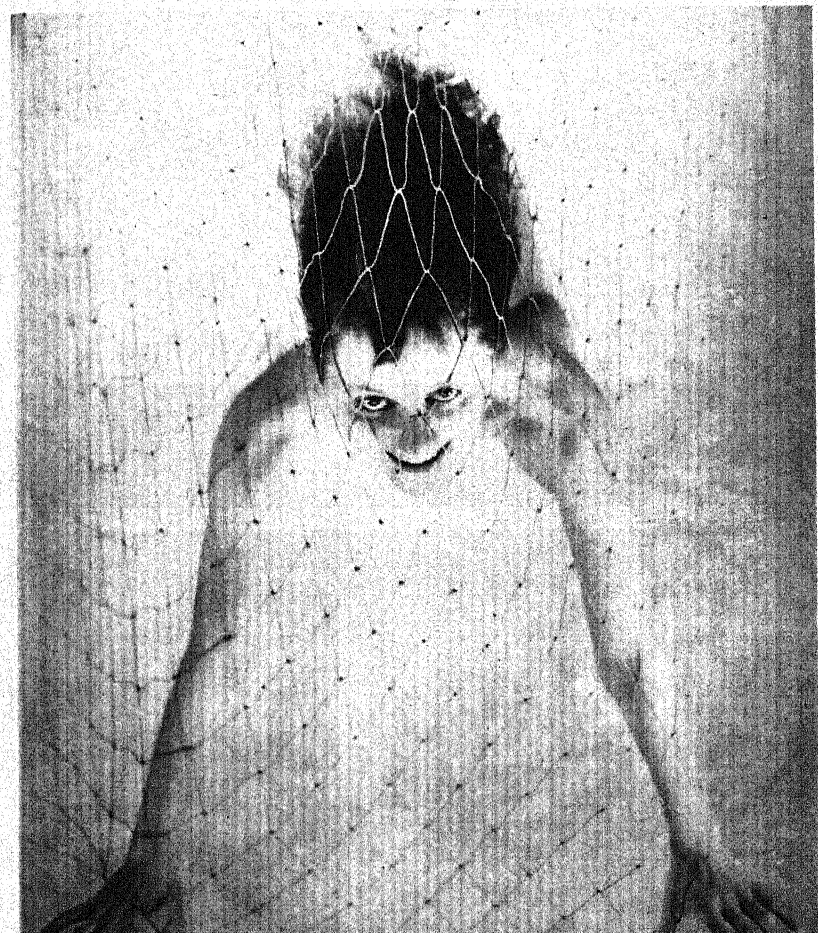


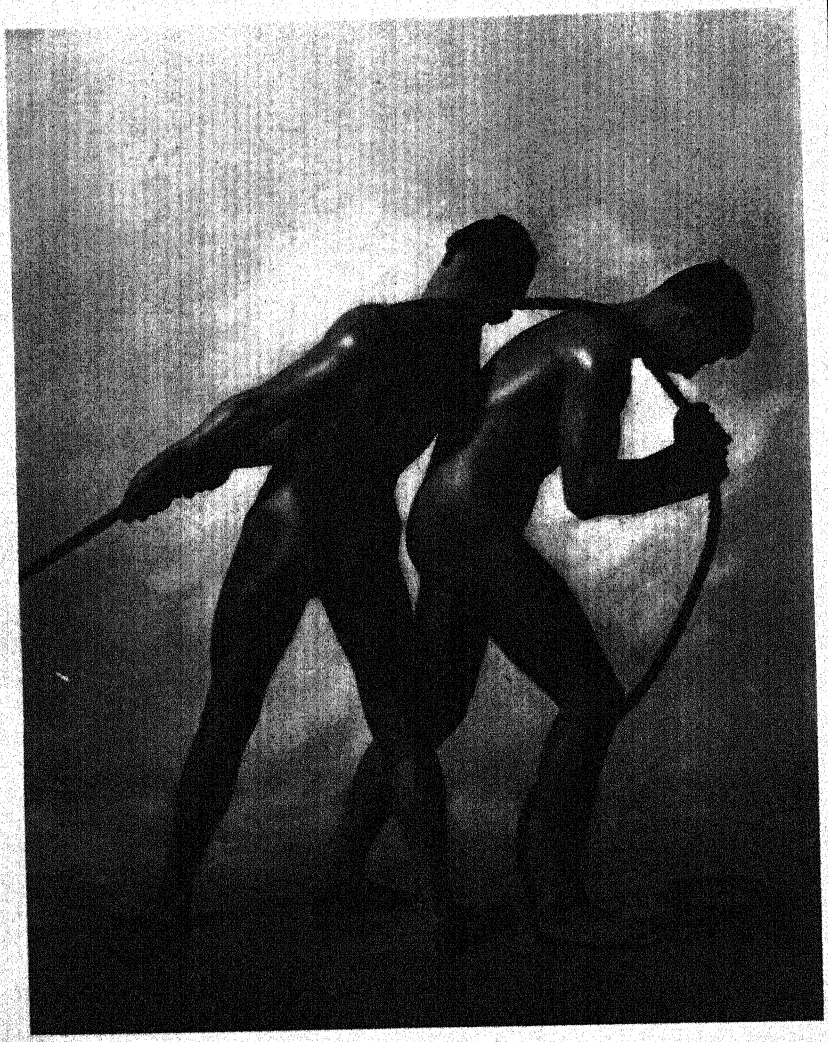


THE SHAWL R. N. HAILE



THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC, 1937





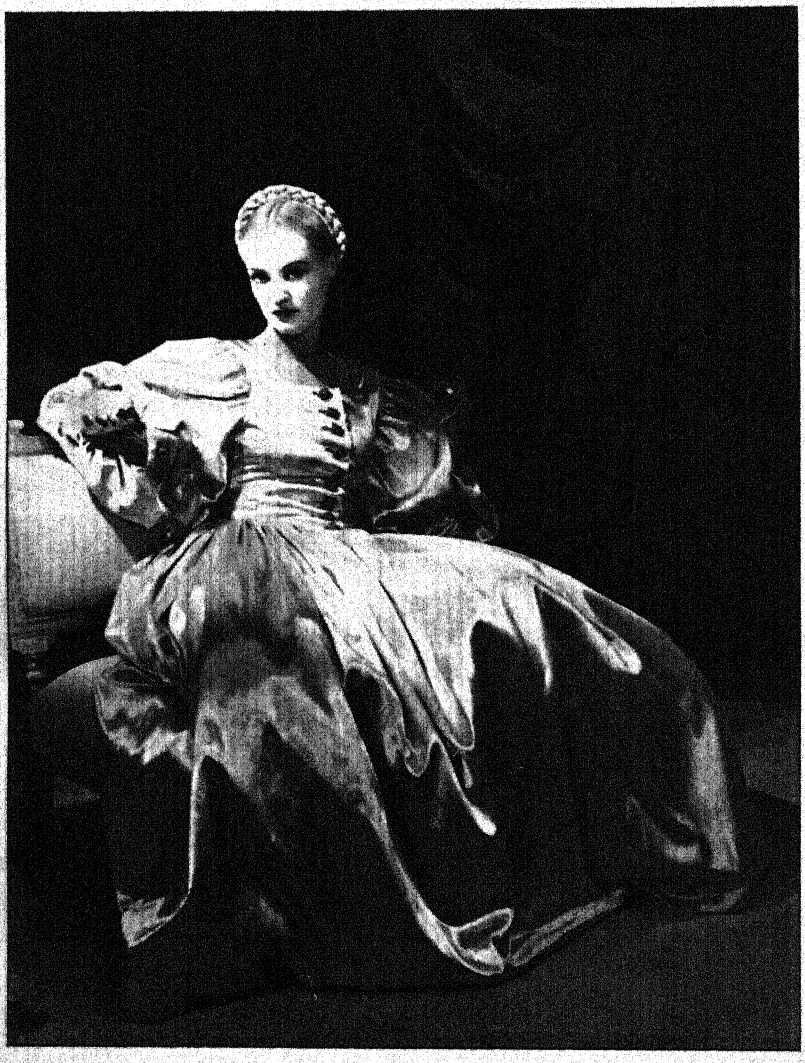
TWO MEN ON A ROPE

DONALD S. HERBERT



ROMANY CHILD

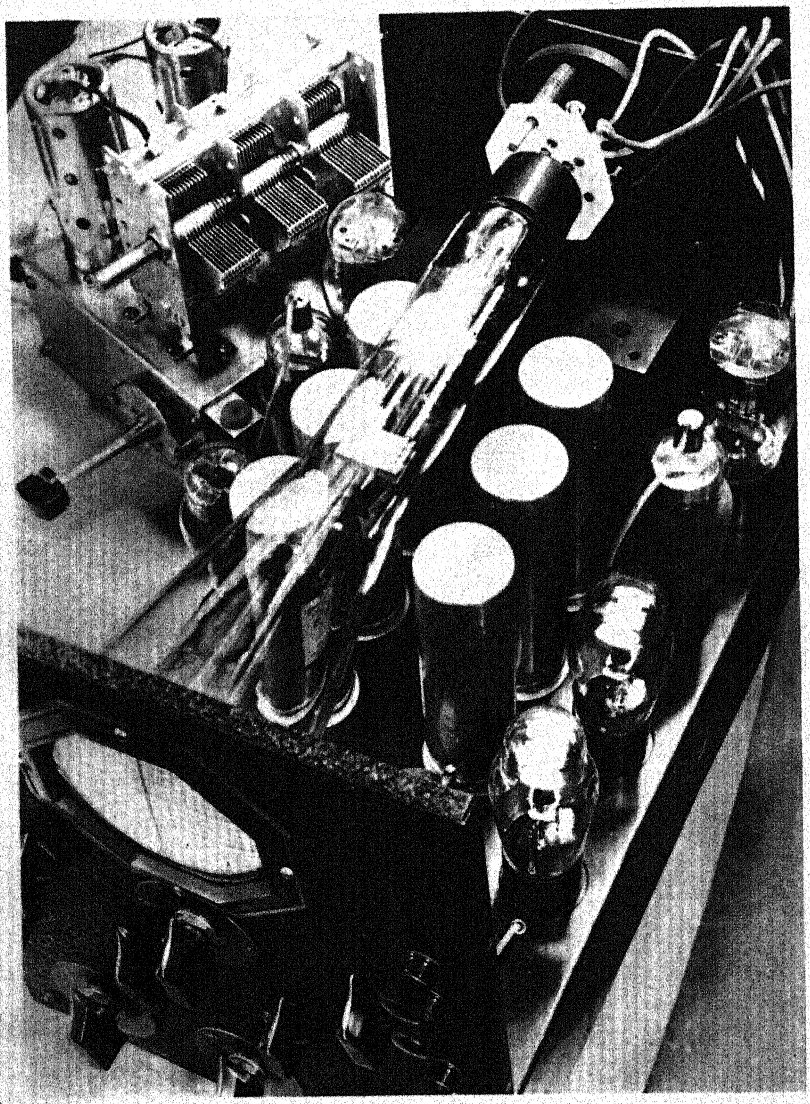
JOHN ERITH

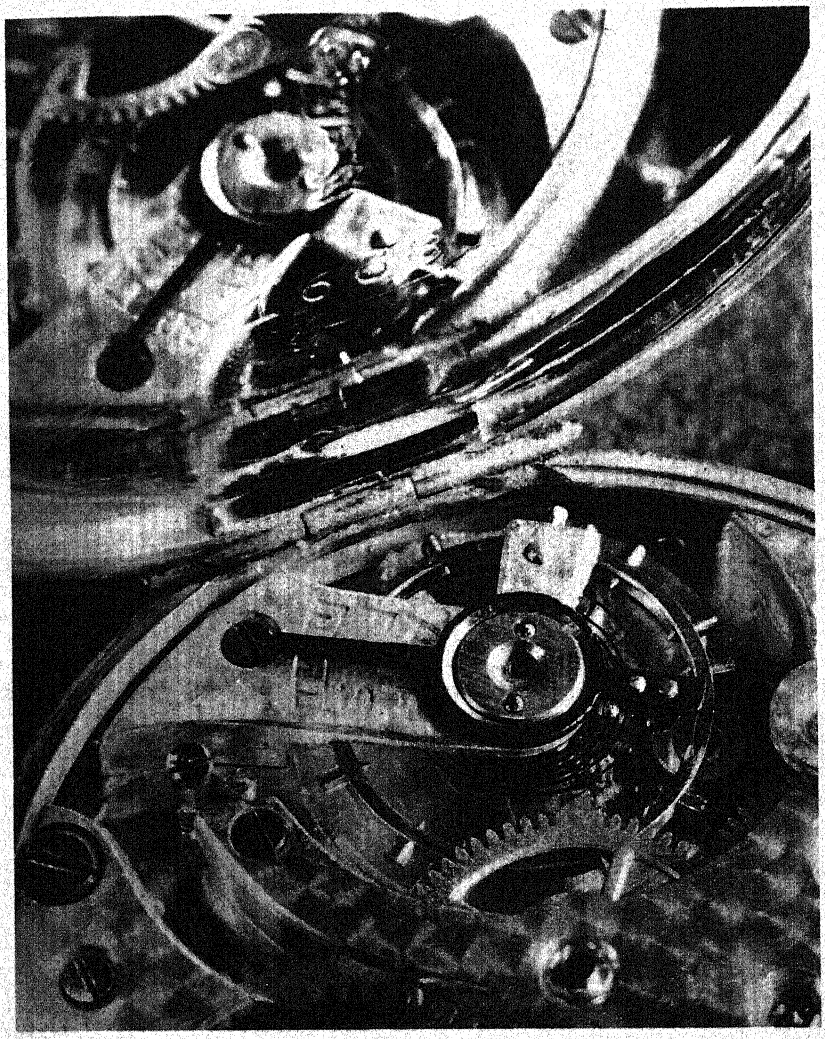


MASQUERADE ROSALIND MAINGOT

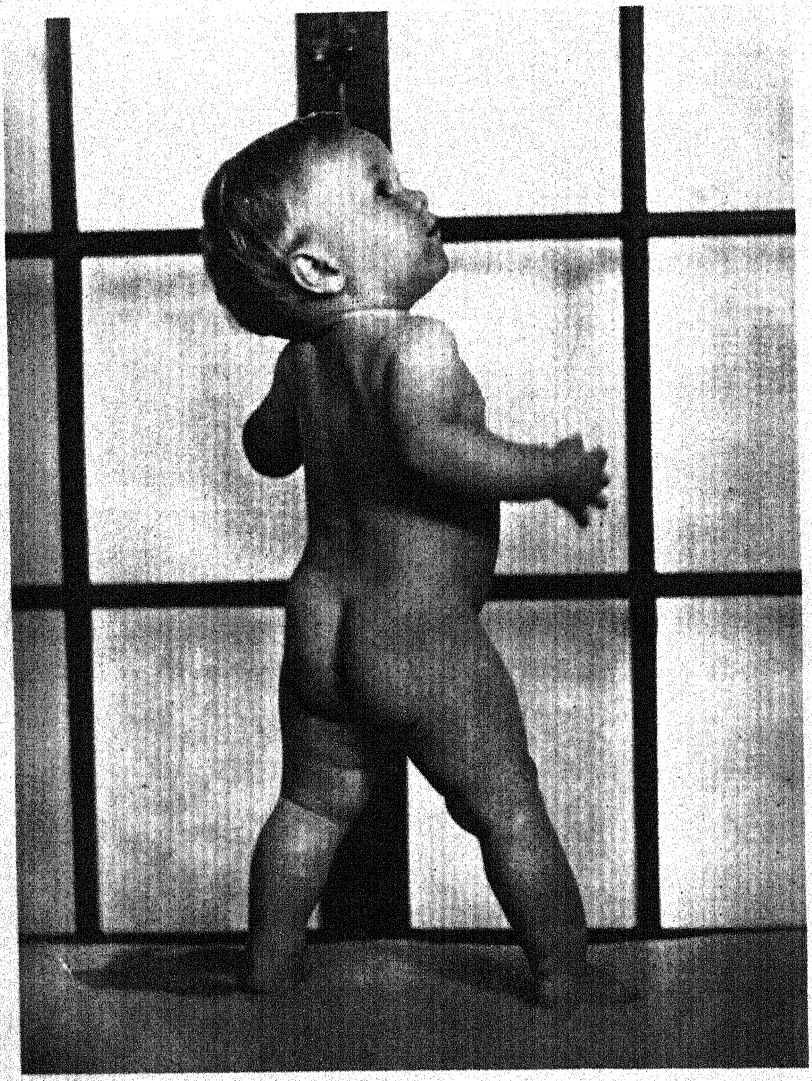


SPEECH ! NORMAN A. SQUIRE





WRIST-WATCH ESCAPEMENT GEORGE L. WAKEFIELD





THE SUMMER HOLIDAY JOAN MUSPRATT



JULIAN SMITH

OBITUARY.

Among those whose deaths have taken place since the 1936 volume of the BRITISH JOURNAL ALMANAC was closed for printing are :—

Arthur Lockett (December 28th, 1935).
William F Butcher (January 12th, 1936)
Henry W. Bennett (February 6th, 1936).
Herbert Lambert (March 7th, 1936).
E. G. Handel Lucas (April 4th, 1936).
Lt.-Col. V. B. Ramsden, D.S.O. (April 5th, 1936).
Wilfred E. L. Day (July 16th, 1936).
Sir Henry Wellcome (July 25th, 1936).
C. L. Finlay (July 30th, 1936).
John Hay Taylor (Aug... 25th, 1936).
Sir James Norval (September, 1936).
H. C. Messer (September 28th, 1936).

Henry W. Bennett.

Editor of the BRITISH JOURNAL OF PHOTOGRAPHY from August, 1934, and joint editor of the BRITISH JOURNAL ALMANAC, until his death, Henry W. Bennett was a man of wide photographic experience, with an encyclopædic knowledge of photography, and the writer of many special articles and handbooks. For forty years he was instructor at the Great Eastern Mechanics' Institute, and as a lecturer was widely known. He was an indefatigable worker, his practical work centering mainly around architecture and engineering subjects, of which he was a frequent exhibitor, his numerous awards testifying to the excellence of his work. He was a leading authority on intensification, reduction, bromide and P.O.P. toning and lantern slides. He was also an excellent draughtsman and a musician, and had a knowledge of several languages. He was 75 years of age.

William F. Butcher.

W. F. Butcher was one of the best known men in the photographic trade. As a youth he entered his father's business as a chemist at Blackheath, and later, with his brother, added a photographic department, and by the end of 1894 their "Primus" specialities were well known. By the year 1901 the business had increased to such an extent that more central and commodious premises were found necessary, and in 1902 the firm was established at Camera House, near Ludgate Circus, E.C. Later, Mr. Butcher, acting in conjunction with Mr. Edgar Houghton, formed the British Photographic Industries, Ltd., an amalgamation of six well known photographic firms, with their business organisation centralised at 88/89, High Holborn, London. The Houghton-Butcher amalgamation later became known as Ensign, Ltd., and Mr. Butcher was one of the directors of it until his death at the age of 70 years.

Herbert Lambert.

By the death of Herbert Lambert at the age of 55 years the world of professional portrait photography lost one of its best known workers. His father, Henry Lambert, was a pioneer in camera portraiture, and in 1900 Herbert succeeded

his father and brother in the conduct of a portrait studio in Bath, and it was not long before he gave expression to his genius and personality. A few years later he started exhibiting, and his work was quickly appreciated and sought after. His lectures before the Royal Photographic Society and the P.P.A. Congress will long be remembered, and his book on Studio Lighting will always remain a standard work. In 1926 he accepted the position of managing director of the old-established business of Elliott & Fry, retiring only a few weeks before his death.

Lieut.-Col. V. B. Ramsden.

Lieut.-Col. Ramsden, D.S.O., M.C., was production director of Ilford Limited, and took a very active part in the work of amalgamating the various companies which formed the group. He joined the Board in 1930, after a most distinguished career in the army. He was 48 years of age.

Sir Henry Wellcome.

Sir Henry Wellcome, who died at the age of 82, came to England from America, and in 1880 founded the business of Burroughs Wellcome & Co., of "Tabloid" fame, in conjunction with Mr. S. M. Burroughs. A great part of his large income was employed in the foundation and maintenance of research institutions and in other benevolent works.

Wilfred E. L. Day.

Known to most people as "Will Day," Wilfred Day was a pioneer of British cinematography, and a most enthusiastic and successful collector of historic cine and photographic apparatus dating from the earliest times. He had an encyclopædic knowledge of historic and other events, and was a prominent figure in the trade, and a large number of cinematographic appliances and novelties were directly due to his invention or to his activities. He was 63 years of age.

C. L. Finlay.

The inventor of the present-day Finlay process of screen-plate colour photography on the principle of the Joly process, C. L. Finlay was an indefatigable worker in colour. He patented a process—the Thames plate—in 1906, and later was associated with the colour processes known as the Paget and the Duplex.

E. G. Handel Lucas.

Handel Lucas was a gifted portrait and still-life painter, and was an exhibitor at the Royal Academy. He was a keen photographer, and evolved the "Handelchrome" method of colouring prints. He was 75 years of age.

J. Hay Taylor.

J. Hay Taylor, son of J. Traill Taylor, a former editor of the BRITISH JOURNAL OF PHOTOGRAPHY, was for many years editor of the MAGIC LANTERN JOURNAL. He was a leading authority on the optical lantern and its accessories. He was 79 years of age.

Arthur Lockett.

Arthur Lockett, author of "Camera Lenses" (1925) was well known as a frequent contributor on technical subjects of particular interest to professional photographers, mainly portraiture and optics.

H. C. Messer.

For many years one of the foremost colour workers, H. C. Messer was a popular lecturer and demonstrator known to photographers all over the country.



PROPERTIES OF SENSITIVE MATERIALS.

Thallium Emulsions.—At a meeting of the Royal Photographic Society, W. J. G. Farrer described the results of his recent work on thallium emulsions. Briefly, these had not been found to possess any advantages over silver emulsions, and were very slow. Direct physical development of thallous bromide emulsions was very slow, but preliminary conversion of the thallium to silver emulsion by bathing in silver nitrate resulted in normal development with an M.Q. developer. The use of iodides gave no useful results, these appearing not to play the same part as in silver emulsions. Ammonia as a ripening agent was useless on account of its fogging action. Gelatine, also, had not the same function as with silver, and had little effect on speed. Colour sensitisation was possible, but not so effective as with silver, especially for the red. Summing up, Mr. Farrer said that it did not seem probable that thallium emulsions were likely to lead to increased speed or diminished graininess, or to solve the problems of the photographic chemist.—Phot. Journal, Sept., 1936, pp. 486-492.—B.J., 1936, May 8, p. 298.

The Action of Heat on Photographic Materials.—Julian M. Blair and Philip A. Leighton, in order to study the production of a developable density by heat, heated Eastman Positive plates in an electric oven at temperatures between 78 degs. C. and 190 degs. C. for varying times. After heating, the plates were rapidly cooled again, then developed under identical conditions with the same developer. After fixing, washing, and drying, the photographic density was measured in a densitometer. As the plates had not been submitted to the action of light, either before or after heating, the density found could only be due to the action of heat. The curves of the density as a function of the time of exposure for each temperature are altogether analogous to those obtained with light.

No reduction of density by prolonged exposure is observed below 170 degs. C., but it becomes apparent above 180 degs. C. The authors have given for the case of light the equation :

$$\frac{dx}{dt} = k_1 x^{\frac{1}{2}} (b-x) - k_2 x$$

which gives the speed of formation of the latent image, on the supposition that the latter is due to a direct reaction of speed k_1, and an inverse reaction of speed k_2.

This equation applies also to the curves obtained, but the values k_1, k_2 and b depend on the temperature.

In the main, the effects of heat and light are similar.—J. Opt. Soc. Amer., Vol. 24, p. 185.—B.J., 1936, Aug. 14, p. 519.

Successive Maxima in Solarisation.—Dr. Helmut Borst describes some interesting work on solarisation. For some time it has been known that solarisation is not a simple phenomenon, and that the reversal of the image upon excessive exposure may be followed, on still further increasing the exposure, by an increase in density, and in fact a graph of density plotted against exposure may exhibit a series of maxima alternating with regions where the deposit is a minimum. Meidinger, in his book "Die Theoretischen Grundlagen der Photographischen Prozesse" maintains that this second reversal in the solarisation region can be attributed to the direct blackening due to separation of silver bromide into silver and bromine. With the object of testing this theory, a plate was exposed at a distance of 80-cm. from a 500-watt Nitraphot lamp for periods from 1 second to 4½ hours, under carefully controlled conditions, such as the maintenance of constancy of the light source, and avoidance of excessive heating of the film. The plate was then cut in half, and one half developed in an M.Q. developer for 3 minutes, fixed, washed, and measured photometrically. The other half was at once measured photometrically by red light, with the object of eliminating any error due to the dissolving action of the fixer on any latent silver. In each case the curve of density showed successive maxima in the region of solarisation, but those of the undeveloped plate were far too small to account for the comparatively high maxima of the plate that had been developed and fixed, so that direct blackening could not be held mainly responsible for the phenomenon. The author suggests that whilst normal solarisation can be attributed to coagulation of silver nuclei, regression phenomena may, on continued exposure, occur in the depth of the film, and the subsequent maxima may therefore be attributable

to the combined effect of these two processes. He also points out that commercial emulsions are not homogeneous, but contain grains of varying size and degree of ripening, which may behave differently under solarisation conditions.—"Phot. Ind.", XXXIII, No. 48, p.p. 1057-8, November 27, 1935.—B.J., 1936, Jan. 3, p. 10.

Storing Photographic Materials.—D. M. Cuthbertson describes an experiment made with the object of finding a means of ensuring optimum humidity in stored sensitive material. Honey was chosen as the substance whose function was to maintain the necessary humidity balance, and a box of plates and a packet of bromide paper, after being left all night wrapped in damp newspaper, were placed in an air-tight tin with some honey, the whole contained within an aluminium tin which had been perforated, and stored for ten years under conditions of severe heat fluctuation—up to 110 deg. F. in the summer and below freezing point in the winter. When opened, the contents showed normal properties, apart from a possible slight slowing of the bromide paper, whilst the honey, which had granulated, was moist for a fraction of an inch from the top. A control packet of plates and of paper stored under identical conditions but without the honey had deteriorated badly, the paper being useless, and the plates usable, but very much fogged, particularly near the edges.—B.J., 1936, April 17, p. 242.

Stability of Film Slides for Record Purposes.—The United States Bureau of Standards has investigated the stability of film slides from the point of view of brittleness, chemical deterioration, etc., under the artificial ageing conditions of extreme moisture and temperature applied in cycles.

When new nitrate films were heated in dry air at 100 degs. C., and reconditioned, which is the accelerated ageing test used for paper, they became permanently brittle in ten days, and evidence of extreme chemical deterioration was found. Under the same conditions, new acetate films retained good flexibility, even after heating for thirty days, and showed little evidence of chemical change. On heating the films in an atmosphere of 95 per cent. relative humidity both types showed evidences of deterioration, although the nitrate films again were much less stable than the acetate. On putting the films through a cycle of various humidity conditions, it was found that the nitrate films retained their flexibility better than the acetate on loss of moisture, and showed less dimensional changes. The acetate films became quite brittle at low

humidity, but their flexibility and approximately their original dimensions were restored on exposing them to a medium degree of humidity. While the evidence is not yet complete, that already obtained shows that acetate films offer considerable promise for use as permanent records, if properly made and if care is taken to prevent them drying out too much. They should be stored in air having a relative humidity of about 50 per cent. After they have been used in a projector, they should be exposed to air of this humidity in such a way that the air has free access to all parts of the film to restore moisture that may have been lost, and they should not be used again until moisture equilibrium has been obtained. This moisture condition, plus a low temperature (not above 50 degs. F.) is suitable for prolonging the life of nitrate films. Other problems, such as the use of protective coatings, effect of ageing on the emulsion, and conditioning of films for storage are still being studied.—B.J., 1936, June 26, p. 409.

Non-reactive Pyrolusite Anti-halation Layers.—I. G. Farbenindustrie have patented an improvement of the known method of using layers of pyrolusite, or hydrated oxides of manganese in gelatine, as anti-halation layers for sensitive material. An objection to the method at present used, wherein the pyrolusite is produced in the gelatine in colloidal form by causing potassium permanganate solution to act on gelatine or by reducing potassium permanganate by means of manganous salts in the presence of gelatine or other colloid to form manganese dioxide is that the pyrolusite is not in the form of pure manganese dioxide, but in the form of a mixture of strongly reactive hydrates of varying composition which adversely affect the photographic emulsions coming into contact with them. By the new method, the particles of pyrolusite are brought to about 0·1—2·0 times that of the silver grain and the absence of higher hydrates ensured by thermally treating the pyrolusite, for example by intense drying. A suitable pyrolusite can be produced by reduction of potassium permanganate (with alcohol for example) in aqueous solution. The separated pyrolusite is dried at about 130 degs. C., ground, if necessary, and a suspension in gelatine cast as an anti-halation layer which is free from the harmful effects described. (Patent Eng. No. 443,790, of October 4, 1933, by I.G. Farbenindustrie A.-G., Frankfurt, Germany.)—B.J., 1936, May 15, p. 312.

NEGATIVE AND POSITIVE PROCESSES AND PROCESSING.

Pseudo-Solarisation as a Practical Process.—The unusual "negative-cum-positive" prints produced by certain Continental photographers are shown to be due to the phenomenon of pseudo-solarisation, which causes a reversal of the dark shadows of the subject to light areas, and further causes the peculiar black line round the brightest areas of the subject in the final print. These results may be produced by controlled fogging of the negative during development, and a simple process to this end makes use of the red sensitivity of panchromatic materials. It is essential that the subject should include strong contrast and areas of dense black shadow, otherwise the result cannot be expected to be satisfactory. The fogging exposure hardly affects areas which are not shadows. Using metol-hydroquinone developer, and with normal exposure in the camera, the panchromatic plate or film is developed for one-third to one-half normal development time in a dish, in the dark. At the expiration of this time, the red dark room lamp is turned on, and a fogging exposure given. The precise fogging time required depends on the lamp power, distance from negative (which remains under developer throughout the process), and the emulsion characteristics, but a useful practical guide is to watch the unexposed edges of the negative. As soon as these show signs of turning grey as they lie under developer, the red light is turned out again and development continued for normal time plus 25 per cent. The extra time is desirable in order to obtain sufficient contrast, for the fogging exposure flattens the image greatly.

A variation of the process consists of exposing a panchromatic plate behind a normal negative, and fogging it excessively during development. The result will be more negative than positive, so that a print may be obtained showing the usual characteristics of pseudo-solarisation. In this case the fogging exposure must necessarily be protracted.

The process has a comparatively limited application to practical photography, though it may be useful for advertising work.—B.J., 1936, Aug. 14, p. 510.

Developing with Neutral Amidol.—Richard Schimmrich points out that the tendency often observed of an amidol developer to fog and unreliability is due solely to the variable alkalinity of the sodium sulphite. He recommends the use of a neutral developer, prepared as follows:—25 gm. anhydrous

sodium sulphite is dissolved in 1,000 c.c. water. Of this just as much as is needed for immediate development is poured into a white dish, and a few drops of an alcoholic solution of phenolphtalein added. The alkaline reaction of the sulphite solution will be indicated by the pale rose coloration which immediately appears. A 10 per cent. diluted solution of acid bisulphite lye is then added drop by drop until the rose colour just disappears. At this point the solution is perfectly neutral. There is, however, no need for great accuracy ; care only should be taken not to add too much lye, to the extent of cubic centimetres in excess, lest the developer exhibit the undesirable property of acid amidol of slow development. Finally, ½ gm. amidol is added to each 100 c.c. of the neutralised sulphite solution, and the developer is ready for use. As there is no need for accuracy here, there is no necessity to weigh this out ; ½ gm. amidol is about as much as will cover the point of a penknife.

About 5 drops of 10 per cent. potassium bromide solution should be added to every 100 c.c. of developer. More than this is entirely unnecessary. If amidol is made up in this manner it exhibits all the properties of a good developer : it is quick-working ; in negative development it gives good, clear shadows, and with papers a pleasing black or blue-black image with clean high-lights and strong shadows. An advantage that is not to be despised is that it is not very rapidly exhausted, and moreover, remains usable even in an open dish for at least a day. When used for gaslight papers with three or four times as much bromide, the image tends to an olive or brown-black. Instead of the bisulphite lye, a 5 per cent. solution of potassium metabisulphite may be used.—B.J., 1935, Nov. 29, p. 758.

Rapid Processing of Negative Material.—In Communication No. 577 from the Kodak Research Laboratories, H. Parker and J. I. Crabtree analyse the requirements of a satisfactory rapid processing procedure for Press work wherein it is necessary to obtain a print from an exposed negative as quickly as possible. The time required by each step in this process is considered in order to obtain as great a reduction as possible in the total time. Their conclusions are summarised as follows. The following rapid hardening two-bath developer is very well suited for these conditions, because it provides for thorough hardening of the emulsion during development, it may be used at temperatures from 65 deg. to 85 deg. F. (best results are obtained at 75 deg. to 80 deg. F.), and it gives a fairly constant degree of development in spite of variations in the development time. The solutions are stable,

and are not readily oxidised even when standing in dishes.

RAPID TWO-BATH DEVELOPER
(Formula SD—6).

First Bath.

	Avoirdupois	Metric
Elon	44 grains	3 gms.
Sodium sulphite, desiccated	365 grs.	25 gms.
Hydroquinone	88 grs.	6 gms.
Sodium sulphate, desiccated	3½ ozs.	100 gms.
Sodium carbonate, desiccated	292 grs.	20 gms.
Water to	32 ozs.	1 litre

Second Bath.

SOLUTION 2A.	Avoirdupois	Metric
Phenosafranine (1:1000 sol.)	5 drs.	20 c.c.s.
Sodium sulphite, desiccated	1⅔ ozs.	50 gms.
Potassium bromide ...	30 grs.	2 gms.
Water to	32 ozs.	1 litre
SOLUTION 2B		
Formalin (40 per cent. sol.)	6 ozs.	200 c.c.s.
Water to	32 ozs.	1 litre

To make the second bath, mix equal parts of solutions 2A and 2B at time of use.

The stock solutions will keep; the mixture will not. The negative should be placed for one minute in the first bath, then transferred to the second bath without rinsing, and treated for one minute with agitation, taking care not to expose the film unnecessarily to the air in order to avoid aerial fog.

If this treatment does not give sufficient contrast, the negative can be rinsed for one or two seconds and returned to the first bath for fifteen to thirty seconds or longer as desired. This developer is not recommended, however, in cases where it is necessary to obtain the highest contrast or the highest possible emulsion speed.

After development, the film should be rinsed for a few seconds in water or an acid stop-bath, and fixed in the F-5 fixing bath. It may then be washed briefly in running water and dried rapidly with warm air blasts (conveniently obtained with small electric hair-dryers), or it may be placed in a special holder and printed from while wet.

When rapid fixing is desired, it is preferable to increase the hypo concentration to 12-oz. in 32-oz. (360-gm. in one litre).

ACID STOP BATH (SB—1).

	Avoirdupois.	Metric.
Water	32 ozs.	1·0 litre
Acetic acid (28 per cent.)	1½ fl. ozs.	48·0 c.c.s.

Acid Hardening Fixing Bath (F—5).

	Avoirdupois	Metric
Water (about 125°F.) (52°C.)	20 ozs.	600·0 c.c.s.
Sodium thiosulphate (hypo)	8 ozs.	240·0 gms.
Sodium sulphite, desiccated	½ oz.	15·0 gms.
Acetic acid (28 per cent. pure)	1⅔ fl. ozs.	47·0 c.c.s.
Boric acid, crystals ...	¼ oz.	7·5 gms.
Potassium alum	½ oz.	15·0 gms.
Cold water to make ...	32 ozs.	1·0 litre

The characteristics of this developer with Eastman Super-Sensitive Panchromatic cut film (July, 1935) are given in Tables I and II, together with those of several rapid single-bath developers for short times of development.

Table I.

Development Characteristics of Rapid Developers with Eastman Super-Sensitive Panchromatic Cut Film (July, 1935) at 65° F.

Developer	Time	Gamma	Fog	Relative Emulsion Speed Per cent.	Highlight Density
D–82	1 min.	0·57	0·12	85	0·73
D–82 + caustic ...	1 ,,	1·00	0·15	105	1·33
D–9	1 ,,	0·55	0·10	90	0·70
D–9 + formalin ...	1 ,,	0·52	0·12	70	0·63
D–8	1 ,,	1·29	0·12	35	1·04
D–72	1 ,,	0·40	0·12	65	0·50
D–82	2 ,,	0·83	0·12	125	1·15
D–82 + caustic ...	2 ,,	1·35	0·21	125	1·88
D–9	2 ,,	0·89	0·12	110	1·19
D–9 + formalin ...	2 ,,	0·81	0·14	75	0·98
D–8	2 ,,	1·49	0·15	60	1·54
D–72	2 ,,	0·70	0·13	85	0·96
Two Bath (at 75° F.) (1st Bath)	1 ,,	0·65	0·15	105	0·91
(2nd ,,)	1 ,,				
D–82	3 ,,	1·01	0·17	130	1·45
D–82 + caustic ...	1 ,,	1·00	0·15	105	1·33
D–9	2½ ,,	1·02	0·14	110	1·40
D–9 + formalin ...	3 ,,	1·00	0·17	75	1·20
D–8	40 sec.	1·00	0·11	30	0·75
D–72	3½ min.	1·02	0·17	100	1·30
Two Bath (1st Bath)	1 ,,	1·00	0·25	105	1·35
(2nd ,,)	1 ,,				
(1st ,,)	1½ ,,				

TABLE II.

Characteristics of Developers Suitable for Under exposures (Times of Development for Optimum Emulsion Speeds).

Developer	Time	Gamma	Fog	Rel. Emuls. Speed	High-light Density
D–82	8 min.	1·20	0·40	155	2·04
D–82 + caustic ...	3 ,,	1·50	0·40	145	2·25
D–9	9 ,,	1·45	0·40	150	2·25
D–8	6 ,,	1·60	0·40	115	2·30
D–72	14 ,,	1·33	0·40	120	2·07

The relative emulsion speeds are expressed in percentages, the speed obtained by developing for 3½ minutes in D-72 (gamma 1·0) being taken as 100 per cent.

It will be noticed that the two-bath developer compares favourably with other developers for the lower degrees of contrast, but that it does not compare so well when development is forced in order to obtain high contrast or the highest possible emulsion speed.

TABLE III.

The following formulae are referred to in the latter part of this article.

D—72.

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	16 ozs.	500·0 c.c.s.
Elon	45 grs.	3·1 gms.
Sodium sulphite, desiccated	1½ ozs.	45·0 gms.
Hydroquinone	175 grs.	12·0 gms.
Sodium carbonate, desiccated	2¼ ozs.	67·5 gms.
Potassium bromide ...	27 grs.	1·9 gms.
Water to make	32 ozs.	1·0 litre

CAUSTIC PROCESS DEVELOPER (D—9).

STOCK SOLUTION A.	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	16 ozs.	500·0 c.c.s.
Sodium bisulphite	¾ oz.	22·5 gms.
Hydroquinone	¾ oz.	22·5 gms.
Potassium bromide ...	¾ oz.	22·5 gms.
Cold water to make ...	32 ozs.	1·0 litre
STOCK SOLUTION B.		
Cold water	32 ozs.	1·0 litre
Sodium hydroxide	1¾ ozs.	52·5 gms.

For use up to 90° F., mix equal parts of A and B, and add 10 c.c. of formalin (40 per cent.) and 10 c.c. of phenosafranine solution (1:1000) per litre of mixed developer (2½ drams per 32 ozs.).

D—82.

	Avoirdupois	Metric
Elon	200 grs.	14·0 gms.
Sodium sulphite, desiccated	1¾ ozs.	52·5 gms.
Hydroquinone	200 grs.	14·0 gms.
Sodium hydroxide	125 grs.	8·8 gms.
Potassium bromide ...	125 grs.	8·8 gms.
Wood alcohol	1½ ozs.	48·0 c.c.s.
Water to make	32 ozs.	1·0 litre

D—8.

	Avoirdupois	Metric
Sodium sulphite, desiccated	2 ozs.	60 gms.
Hydroquinone	1 oz.	30 gms.
Sodium hydroxide	365 grs.	25 gms.
Potassium bromide ...	292 grs.	20 gms.
Water to make	32 ozs.	1 litre

CHROME ALUM FIXING BATH.

(F—23)

SOLUTION A.	Avoirdupois	Metric
Sodium thiosulphate (hypo)	2 lbs.	960·0 gms.
Sodium sulphite, desiccated	1 oz. 290 grs.	50·0 gms.
Water to make	96 ozs.	3·0 litres
SOLUTION B.		
Water	20 ozs.	600·0 c.c.s.
Sodium sulphite, desiccated	290 grs.	20·0 gms.
Sulphuric acid, 5 per cent.	5 fl. ozs.	160·0 c.c.s.
Potassium chrome alum ...	4½ ozs.	128·0 gms.
Water to make	32 ozs.	1·0 litres

Dissolve the constituents of Solution A and Solution B and cool bath to 70° F. (21° C.). Add Solution B slowly to Solution A while stirring the latter thoroughly.

NON-HARDENING ACID FIXING BATH.

(F—24.)

	Avoirdupois	Metric
Water (about 125° F.) (52° C.)	16 ozs.	500·0 c.c.s.
Sodium thiosulphate (hypo)	8 ozs.	240·0 gms.
Sodium sulphite, desiccated	145 grs.	10·0 gms.
Sodium bisulphite	365 grs.	25·0 gms.
Water to make	32 ozs.	1·0 litre

SINGLE-BATH DEVELOPMENT.

If the solutions for the two-bath developer are not available, the D-72 developer may be used full strength, developing about two minutes at 65 deg. F. The solution may be used up to 80 deg. F. with the development-time reduced accordingly. After development, the film should be rinsed for about five

seconds in an acid stop-bath and fixed for three minutes or longer in the F-23 chrome alum fixing bath with thorough agitation, especially during the first minute (at temperatures below 75 deg. F., the F-5 fixing bath may be used).

If the film is not agitated when placed in the chrome alum fixing bath, a greenish-white scum of basic chromium sulphite may be deposited on its surface. This should be removed by swabbing the wet film with moist absorbent cotton, since it is very difficult to remove after the film has been dried. Its formation can be prevented by rinsing and agitating the film properly.

The use of a hardening stop-bath is not recommended, because the time available for treatment in the stop-bath is only a few seconds, much too short for any effective hardening action.

Development at Higher Temperatures.

With the two previous methods of development, if the room temperatures are very high, it is necessary to cool the solutions to about 80 deg. F. If this is not desirable, the D-9 caustic process developer with the addition of 1 per cent. formalin may be used at temperatures up to 90 deg. F. The development time should be one and a half to two minutes at 65 deg. F., and less at higher temperatures. After development, the film should be rinsed for about five seconds in an acid stop-bath, and fixed until it has cleared in the F-5 fixing bath.

The proper development time at any temperature can be determined from the following table, if the time which gives the desired degree of development at 65 deg. F. is known. Although the temperature coefficients of the other developers vary slightly, this table is sufficiently accurate for use with any of the developers mentioned in this paper, except the two-bath developer for which the times need not be changed over the temperature range from 65 deg. to 85 deg. F.

Time of Development.

Temp.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.
65° F.	1	30	2	—	2	30	3	—	4	—
70° F.	1	15	1	40	2	—	2	30	3	15
75° F.	1	—	1	20	1	40	2	—	2	40
80° F.	–	50	1	5	1	20	1	40	2	10
85° F.	–	40	–	55	1	5	1	20	1	45
90° F.	–	33	–	45	–	55	1	5	1	25

Ultra-Rapid Developers.

When the film can be processed by machine, and development times of one minute or less are desired, the D-82 developer, with 10-gm. of extra sodium hydroxide added per litre (150-gr. per 32-oz.), or the D-8 developer may be used.

If the required development time is of the order of half a minute, it may be desirable to add 25-c.c. of ammonia to the modified D-82 developer.

DEVELOPER FOR UNDER-EXPOSURES.

When it is desired to obtain the utmost possible shadow detail from under-exposed negatives, the D-82 developer for under-exposures should be used, with a development time of about eight minutes at 65 deg. F.

ULTRA-RAPID FIXATION.

When rapid fixation is desired, the hypo concentration of the fixing bath should be increased to 360-gm. per litre (12-oz. per 32-oz.). If still more rapid fixation is desired, a non-hardening acid bath with added ammonium chloride may be used. Such a bath should only be used, however, with the two-bath developer or with the D-9 developer containing formalin, both of which harden the film, and the use of an acid rinse-bath between development and fixation is most important. The F-24 formula is very suitable for this purpose.

To make an ultra rapid fixing bath, the hypo concentration should be increased to 360-gm. per litre (12-oz. per 32-oz.) and 25-gm. of ammonium chloride added per litre of solution (365-gr. per 32-oz. of solution).—B.J., 1936, Feb. 28, p. 127 *et seq.*

Water Bath Development.—H. A. Robinson has suggested certain modifications of standard procedure in the use of the water bath, and gives a guide to the requisite times of immersion in developer and in water for different classes of negatives. Except in under-exposure, which may require slightly longer, it is agreed that the first immersion in the developer should not be for longer than 10 seconds.

For slight softening the method of doubling the times is quite satisfactory, thus :—

Developer	10 seconds	Water	2 minutes
,,	20 seconds	,,	2 minutes
,,	40 seconds	,,	2 minutes

and so on till the building up is completed.

For the greater softening that really contrasty normally exposed subjects require, 10 seconds in the developer may be followed by 30 minutes in the water with advantage, when it will be found that the image has come well out, evenly all over the plate. Twenty seconds may now be given in developer with 15 minutes in the water-bath. After this, judgment must be used as to whether greater evening out or just a minute or so straightforward development is necessary to give a nicely graded result.

In the case of under-exposure, slightly longer than 10 seconds may be given in the developer to start with and then 10 minutes in water will be enough. The doubling of times may then be employed, but never less than 10 minutes in the water

The system has been used with good effect for roll films, a tank being constructed of wood to enable the film to be stretched flat in the water bath; the bull-dog clips attached to the ends are held by hooks in the ends of the tank, a rubber band taking up slack. The film is softened by immersion in water before attaching the clips, which thereafter do not leave the film.

A warning is given that although the water bath method is suited to pyro-metol as to M.Q. developers, it cannot be used with developers strong in pyro on account of uneven staining and rapid oxidation of the developer while the film is soaking. Also it should not be used with old plates and films, which are liable to mottling in the water. Obviously, the greatest care must be taken to avoid fogging in the long periods of soaking.—B.J., 1935, Nov. 15, p. 728.

Duplicating Negatives by Direct Reversal.—P. C. Smethurst describes a method of making a duplicate negative by direct reversal, using ordinary negative material. Although originally applied as an emergency method, it offers the advantages of somewhat finer grain, no necessity for an intermediate positive, and the simple production of reduced or enlarged duplicates by means of the ordinary enlarger. The time required for the process is not more than twenty minutes in cold weather, and a final point is that the contrast of the duplicate is determined by the choice of the material used rather than by personal skill in the manipulation of development. The final duplicate is, of course, reversed right to left.

Test exposures under a step-wedge show that under the conditions to be described the reversed image is slightly more contrasty than the original for the Ilford Rapid Process Pan plate, almost identically the same contrast as the original with Ilford Special Rapid Pan material, and rather softer than the original when Ilford Soft Gradation Pan plates are used. It is thus possible to modify to some extent the character of the original negative when duplicating it, which is often of use in practice.

Exposure, which is by no means critical, is conveniently made by placing the printing frame at three feet from a motor side-lamp bulb (12-volts—5-watts), and the times (approximate) are:

Ilford Rapid Process Pan	... ...	40 secs.
Ilford Special Rapid Pan	... ...	20 secs.
Ilford Soft Gradation Pan	... ...	10 secs.

When the enlarger is used, a resistance must be placed in series with the lamp until it glows a dull red, at which point the exposure time will be reasonably long.

After exposure, the intermediate image is developed to gamma infinity in Ilford M.Q. developer, used at stock strength, not diluted.

The exact time of development is not very critical so long as it is sufficient, and any slight fog will be removed in the reversing bath together with the intermediate image. At 65 deg. F. the following times will be suitable :—

Ilford Process Pan	3 mins.
Ilford S.R. Pan	6 mins.
Ilford S.G. Pan	9 mins.

When development is complete, the plate is washed in running water for a minute and then placed at once in the following reversing bath :—

Potassium bichromate ...	12 gms.	108 grs.
Water, to	1 litre	20 ozs.
Sulphuric acid, conc. ...	50 c.c.s.	12 drs. 40 mins.

This solution keeps well, and should be used until it is exhausted. Rubber gloves should be worn to avoid staining the hands.

As soon as the plate is covered by the reversing solution, turn on the white light. By rapidly taking out the plate and examining the back, a strong positive print from the original negative should be seen, while the emulsion side will appear almost completely black until the reversing bath begins to attach the silver. After two minutes the image should have disappeared completely, but if it does not vanish in four minutes the reversing bath is exhausted, and must be renewed.

As soon as the silver image has completely dissolved, examine the plate by transmitted light. A negative image should now be seen, though the contrast will seem feeble and the shadows very dense. At this point, wash for two minutes in running water, and clear for at least five minutes in a 20 per cent. solution of sodium sulphite (cryst.). The clearing process must on no account be hurried, and it is preferable to make the clearing bath fresh each time work is done. Insufficient clearing, or inadequate second exposure may result in a partial positive. The simplest way is to hold the clearing bath, with the duplicate negative in it, about six inches from a 60-watt. lamp for three or four minutes, and then to give a supplementary exposure of half a minute at the same distance from the lamp after five minutes clearing and a short rinse.

The plate is then placed in the solution used for first development of the intermediate image, and left there for five minutes. After fully blackening it is washed and dried as usual.

If less density is essential, the reduction is preferably undertaken during clearing.

For this purpose 5 per cent. of hypo is added to the clearing bath. The second exposure must, however, then be at least doubled. For this reason, and also because of extra liability to frilling, the writer prefers to leave the density high without attempting reduction. The extra exposure necessary is seldom a disadvantage.—B.J., 1936, May 22, p. 327.

Brometching.—Richard Lluellyn gives a description of Brometching, a process which he suggests gives, with bromide paper, a rendering of value and quality, not easily to be surpassed. Prints made in this way he states have almost the gradation of a transparency, arising from the fact that, like a transparency, they are exposed for very much longer than is a bromide to be viewed by incident light, and that this greater exposure gives a rich deep-set image within the emulsion which remains when the " clogging " which at first obscures it is cleared away. The resultant image has a " texture of the medium " inherent in the process that it shares with pigment prints, and also (each in its own way) with oil painting, water colours, lithography and etching. It is only the ordinary photographic print that has no such texture.

The method employed in Brometching is to expose from twice to eight times as long as for a normal bromide print, then to dissolve the superfluous silver, and finally to fix and wash.

The choice of paper for making Brometchings is important, for although the process can be worked with smooth and semi-glossy surfaces there is very little object in doing so, as the results, even at their best, except for a slight increase in quality and colour, are not fully characteristic in either respect, and not at all with regard to texture ; no paper texture can be shown where none exists in the base employed. Further, the process is more difficult on such papers, for there is no " key " to hold the image during etching, and in consequence it is apt to be acted upon unevenly, especially at the edges. It is suggested that Ilford Rough lustre heavyweight is a suitable paper for the process, as well as Natural grain single weight, Grained lustre, and for broader effects, Extra rough lustre. It by no means follows, however, that other papers of similar grade are not equally suitable. Kodak Old Master,

for example, gives remarkably plastic and interesting results when correctly treated.

Details of working are as follows :—

Prepare the clearing or etching bath :

A.	Common salt 25% solution	3 drs.
	Strong sulphuric acid, 10% sol. ...	2 drs.
	Water to	20 ozs.
B.	Pot. permanganate 5% sol.	3 drs.
	Water to	20 ozs.

The above quantity will be sufficient for the etching of a print 10 × 8 ins. to 15 × 12 ins. in size.

The print is given, say, from three to four times the normal exposure, and is then developed fully for about three minutes, or 50% longer than the usual time. It is now rinsed and allowed to remain in water whilst 10 ozs. of A. and B. of the etch are mixed. The print is now drained and flooded with some of the mixed etch, care being taken not to pour this directly on to any part that will form the final image. To provide against this it is best to mask one end, or side, of the paper during exposure. It is best not to rock too violently during etching, for the wash of the bath tends to increased action at the edges. Nor, for the same reason, should a larger dish than the paper in use be employed. Irregular action however is hardly to be feared except with quite smooth paper, and in this case the trouble can be cured by using paper a size larger than the print, and then trimming.

Directly the print has been flooded with the etch a strong white light should be turned on so as to see the better how far to carry the etching.

The solution will very soon become slightly discoloured, and when this happens it should be poured off, the print rinsed, and further solution poured on. This will last longer but should soon be replaced again. The third or fourth instalment will probably make the print nearly light enough, and it should now be watched carefully. In order to do this at greater leisure a solution of about half normal strength may be employed. It is for this purpose (and because it deteriorates rapidly) that half the etch has been reserved unmixed.

Directly the highest light that is required to be absolutely white in the finished picture is cleared of silver the print is rinsed until the washing water is free from any pink colouration (two or three changes), and then placed in a fixing bath acidified with metabisulphite. A negative may possibly be used where the catch-light in the eye, for example, remains white, even with the long exposure required by the process. In such a case the next higher light must be taken and the print

etched until that is nearly white. When the print is placed in the fixer a change immediately takes place, and the image which was flat, veiled, and stained, clears at once and stands out boldly in a rich charcoal black.

The greatest control of gradation on any one grade of paper (preferably the normal grade) can be exercised by modification of the developer. The Ilford M.Q. formula is suitable, but should be divided into three solutions :—

M. Sod. sulphite, 2 ozs.; metol, 60 grs.; water to 20 ozs.

Q. Hydroquinone, ½ oz.; Sod. sulphite, 2 ozs.; Pot. bromide, 80 grs.; water to 20 ozs.

C. Sod. carb. (crystal), 6 ozs.; water to 20 ozs.

M. 1 part, Q. 1 part, C. 1 part, water to 8 parts will be used for all normal negatives, but either M. or Q. can take the place of the other, entirely or in part, as required. Contrast and granularity are increased by prolonged exposure, and also by long development; and directly a little experience is gained these modifications can be employed with good effect, and can be used to correct errors. If, for instance, a print is found to be developing very slowly, owing to too little Q. having been used in the developer to suit the negative in hand, its final contrast may be increased by continuing development, say, for four minutes. Conversely, if the print develops harshly this may be corrected by developing for about two minutes only. Local control of values may successfully be practised, for which differently proportioned developers may be used on different parts of the print. Thus, if the hands in a portrait, or part of the sky in a landscape do not print in full gradation by the time the shadows are sufficiently dark, those parts are fully developed with M.Q., applied quite roughly with a cotton wool swab, and then the whole print flooded with Q.C. or M.Q.C. If, again, the part to be subdued abuts on one to be kept high in tone, such as a head supported by a hand that has caught too much light, it is possible to run round the outline of the hand with a soft lead pencil, as accurately as may be, with the orange cap on the lens. Then, with the dry paper lying on a flat-bottomed dish, the area contained by the pencil is painted with metol developer, before flooding with M.Q. When etched the various parts will merge into one another without apparent join either in tone or colour. This treatment takes the place of local increase of exposure in an ordinary bromide, but is much more reliable and easy. It should be noted that when absolutely matt paper is used the print will require waxing, or treating with dope, to prevent a sunk-in appearance.

The process presents no grave difficulties and the resulting prints should be more stable than ordinary bromides, on account of the fact that the image lies *in*, and not *on*, the emulsion. —B.J., 1936, Apr. 3, p. 210; May 15, p. 304.

Ammonia Intermediate Bath for Colour Photographs.—Occasionally in the development of screen colour photographs (Agfa and Lumière) an undesirable staining by dichroic fog occurs after reversal. The dichroic fog, which is characterised by an iridescent blue and red coloration, plainly visible by surface observation of the plate, and is particularly troublesome in the high-lights, is liable to arise through storing at too warm a temperature or through ageing of the material. Recent investigations show that it can be easily avoided by the use of an ammonia bath after the potassium bichromate reversing bath. The colour plate is washed after reversal and then placed for two minutes in a dish containing a very dilute solution of ammonia. The ammonia contained in this washing water immediately neutralises the chromic acid remaining in the gelatine, and the resulting neutral product can be more easily washed out of the emulsion than the chromic acid itself, thus avoiding the formation of the dichroic fog. Since the fog exists only at the surface of the emulsion, it can be wiped off from the plate whilst still wet, with a wad of cotton-wool under water, should it persist despite the use of the ammonia bath.—" Fotografische Rundschau," 1936, No. 6, p. 106.—B.J., 1936, Aug. 7, pp. 503-4.

Contact Printing from Wet Plates.—S. Simons has suggested the following method of printing by contact from the wet negative. First wipe the negative back and front with viscose sponge or chamois leather, lay it on the printer, and surround it with blotting-paper—to soak up any superfluous water from the wet bromide. Next place the printing paper in a dish of clean water for three or four seconds, then drain it for five or six seconds, lay it on the negative (just as you would on a glazing glass to exclude air spaces), place some blotting-paper over this and squeegee lightly (roller type for preference). Now expose (do not trouble about the printer top), remove the blotting-paper, strip off the wet bromide and develop. For extra prints repeat the process.

In this way the prints still retain their qualities until dried off over heat, when they often dry a little more contrasty, but this little action sometimes improves the print; yet on the other hand, one can always develop a shade softer to allow for this drying-in, if delicate half-tones are to be retained, but

it is worth noting, the stronger the print when wet the more it dries in.

The time occupied to make a print from a good-class negative direct from the fixing bath can be summarised as follows :—

1 minute in running water or 8 good changes.
1 minute of six changes with a drop of permanganate of potash stock solution added to each bath or change.
1 minute wiping negative and arranging blotting-paper.
2 minutes exposing and developing.
3 minutes fixing where permanence is not important.
2 minutes for washing (just as for the negative).
2 minutes blotting, "meth"ing, and drying off with gas or electric heat.
Total, 12 minutes.
Rewash negative.

In the summer it is advisable to add chrome alum to the fixing bath.—B.J., 1936, May 1, p. 283.

Printing from Wet Film Negatives.—H. Parker and J. I. Crabtree, in Communication No. 577 from the Kodak Research Laboratories, give three methods of printing from wet films without risk of buckling or damage to the film. In one method the film is held by the edges only in a holder whose construction can be seen from Fig. 1. In the Eastman Processing Frame, Fig. 2, the film can be handled like a plate in printing and enlarging. In either case, the excess water-drops must be carefully removed from the surfaces of the film by wiping with moist absorbent cotton, chamois leather, or viscose sponge. When the processing-frame is used, the water should be shaken as completely as possible from the grooves of the frame before the film is wiped, and care exercised thereafter to prevent shaking more

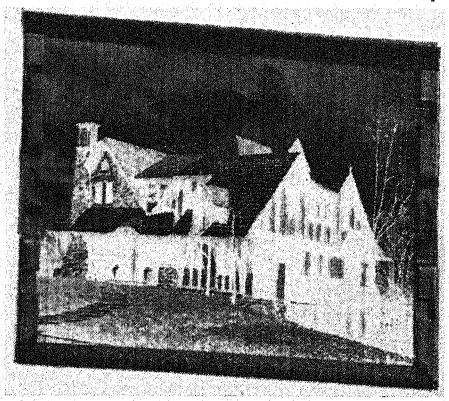


Fig. 1.

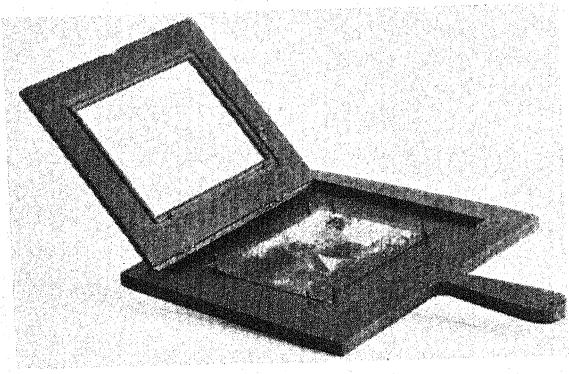


Fig. 2.

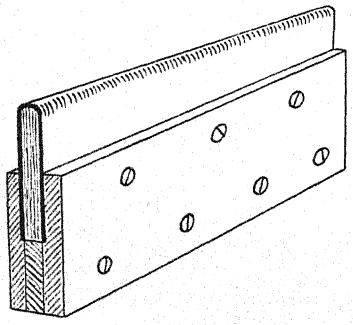
water-drops out on to the surface of the film. The third method, which can only be used in a horizontal enlarger, consists in immersing the film in boiled water or fixing solution (or, for still better cooling, 5 per cent. copper sulphate solution or 2 per cent. cupric chloride) contained in a thin liquid cell, Fig. 3; if fixer is used, it is not necessary to rinse the film before immersion. The cell is made of two sheets of glass clamped by the metal frame to a U-shaped separator cut from soft sheet rubber. The cell is large enough to receive the negative and just thick enough (1 mm. to 2 mm.) to allow the film to slide in freely. The frame should grip the glass sides just tightly enough to hold them firmly, but not tightly enough to cause any strains. It may



Fig. 3.

be necessary to soften the surfaces of the rubber-separator by moistening with benzene just before assembling the cell in order to make the joints water tight. A substitute for the water cell is a sheet of heat resisting glass, but in this case the glass should be cooled with forced ventilation. With all these methods, the lamp housing should be kept as cool as possible. Additional suggestions for cooling are a 1 inch thick water cell between the lamp and negative and/or a sheet of heat-resisting glass, water circulation through the water cell, forced ventilation of the lamp house, and the use of a special high intensity lamp, made by the General Electric Co. of America, which has a water cell built around the bulb cooled by water circulation.—B.J., 1936, March 13, p. 162.

Projection Printing from Wet Plates.—F. O. Stead has devised a simple squeegee for removing the surplus water from negatives preparatory to printing from them wet by projection. With its aid a plate can be removed from the fixing bath, rinsed in water and prepared for the enlarger in the space of a few seconds, where it can remain in perfect safety for over half an hour.



It consists of a piece of white rubber 7 ins. or 8 ins. long, 2 ins. broad, and $\frac{1}{4}$ in. thick, over which is stretched a piece of good-quality chamois leather, the two being clamped together between strips of wood. The rubber should be soft and pliable, and have a perfectly straight edge. The size is a matter of taste. One this size will cover a whole-plate or two quarter-plates placed side by side.

The negative is removed from the fixing bath, rinsed in water, and placed on a sheet of clean white blotting-paper, emulsion-side uppermost. The squeegee is then drawn firmly across the face of the negative. Once or twice is sufficient. The chamois acts as the absorbent, whilst the rubber presses it into intimate contact right across the negative. After drying the back of the negative with a clean cloth it is ready for the enlarger. After printing from it, it can be thoroughly washed and dried in the usual manner.—B.J., 1936, April 17, p. 244.

GRAIN AND FINE-GRAIN DEVELOPMENT

Graininess, Halation, etc.—Origin and avoidance.—Olaf Bloch, in a lantern lecture before the Pictorial Group of the Royal Photographic Society on March 6, 1936, summed up the essentials of the origin of grain and the part played by this and other factors on definition.

Photographic emulsions, he said, consisted largely of silver bromide in the form of crystals in so complex a pattern that really very little was known about them. The crystals had different degrees of sensitivity, different speeds of reaction to light, and different properties of various kinds. The actual sizes of the crystals varied from 1/500,000th of an inch in diameter to about 1/6,000th, an extreme variation of 1 : 80. The bigger grains were always the faster grains, consequently the shadows represented chiefly the action of the larger grains and the high-lights the smaller ones. It was fortunate that all grains were not exactly alike, if they were, no scale of gradation would be possible.

Much time had been spent by a large number of technical people in an endeavour to obtain finer grain emulsions without any loss of the other characteristics which the user valued so highly. Figures were given appertaining to three developers in common use as applied to the same emulsions, all being employed to achieve exactly the same degree of contrast. (These were amplified in a subsequent paper, abstracted below.) There was no question but that by the use of certain types of developer graininess could be reduced, though this involved longer time of development. One method of avoiding graininess was double-coating. Mr. Bloch next touched on radiation or scatter, carefully explaining the difference between this effect and halation. True halation was not scatter. Theoretically, the best means of stopping halation was to place a layer of non-actinic material between the emulsion and the glass. In the case of a point source of light the diameter of the circle of halation was about three and a half times the thickness of the support if the support was of glass, and the thicker the glass the worse the halation was going to be.

Thanks to radiation, or scatter, on the other hand, pictures derived a great deal of charm and beauty, and were it not for this property some deliberate means would have to be contrived for remedying excessive sharpness. Mr. Bloch entered into an analysis of the things which affected the power of the emulsion to give crisp images. These included the amount of turbidity in the emulsion (the more turbidity, within certain limits, the better, and, beyond those limits,

the worse), colour sensitivity, graininess of the developed image, also a number of outside factors, the shape and colour of the object, the treatment in processing, the aperture of the lens, the colour of the light by which the photograph was taken. The finer the grain for ordinary purposes the crisper the image was going to be.—Phot. Journ., July 1936, pp. 378-380.—B.J., 1936, Mar. 13, p. 170.

Comparison of Fine-Grain Developers.—Olaf Bloch has tabulated the results of comparative tests on fine-grain developers carried out at the Ilford Research Laboratory, including several typical formulae and a number of commercial developers. These results generally serve to show that contrasty negatives are unobtainable with fine-grain developers. This is not always a matter of consequence, since vigorous papers can be used in the case of prints when increased contrast is required, and enlarged negatives can be made if necessary by using fine-grain and more contrasty materials for making the positives and negatives. Two types of negative emulsion have been used. (1) Special rapid type of medium grain size and medium contrast; (2) coarser grain and lower contrast of the ultra rapid portrait type.

The speed figures given are purely relative, but if they are multiplied by five they are approximately the H. and D. values. Similarly the graininess figures are purely relative, but the following figures will give some idea of the meaning of the relative values for graininess given in the tables. (The figures are approximate.)

Emulsion.	Relative Graininess.
Gaslight Lantern	1·5
Normal Process	3·0
Special Rapid type	5·0
Extra Rapid Portrait type ...	10·0

DEVELOPERS (all used at 65 degs. F.)

1. Ordinary metol hydroquinone (Ilford formula ID-2).
2. Metol hydroquinone borax (Ilford formula ID-11).
3. Metol hydroquinone sodium phosphate.
4. Paraphenylene-diamine-glycine. (Sease No. 3, the formula for which is given on p. 315.)

5-10.—Commercial fine-grain developers, as sold on the market, the composition of which is not known.

CONTRAST.

It is important to note that each set of negatives was developed for exactly the same gamma (slope of straight line portion of the characteristic curve).

TABLE No. 1
FAST PORTRAIT TYPE.

Developer	NORMAN NEGATIVE (GAMMA = 0·8)				NEGATIVE OF HIGHER CONTRAST (GAMMA = 1·1)			
	Time of Development	Fog	Relative Speed for shadow detail	Graininess	Time of Development	Fog	Relative Speed for shadow detail	Graininess
1	4 mins.	0·11	135	9·5	8½ mins.	0·17	150	9·7
2	12½ ,,	0·19	150	7·9	* —	—	—	—
3	15 ,,	0·06	135	7·8	* —	—	—	—
4	33 ,,	0·17	100	4·8	* —	—	—	—
5	9 ,,	0·10	150	8·8	* —	—	—	—
†6	30 ,,	0·20	105	8·5	* —	—	—	—
7	36 ,,	0·19	130	5·4	* —	—	—	—
8	10 ,,	0·06	100	5·3	* —	—	—	—
9	14 ,,	0·15	190	9·3	* —	—	—	—
10	23 ,,	0·16	85	5·4	* —	—	—	—

* In these cases the particular developer is either incapable of giving this degree of contrast, or is only able to reach it accompanied by undue fog.
† The highest contrast obtainable with this developer is a gamma of 0·7.

TABLE No. 2.
SPECIAL RAPID TYPE.

Developer	NORMAL NEGATIVE (GAMMA = 0·8)				NEGATIVE OF HIGHER CONTRAST (GAMMA = 1·1)			
	Time of Development	Fog	Relative Speed for shadow detail	Graininess	Time of Development	Fog	Relative Speed for shadow detail	Graininess
1	2½ mins.	0·03	38	4·4	4 mins.	0·04	55	4·8
2	7 ,,	0·06	70	3·8	12½ ,,	0·08	79	4·0
3	10 ,,	0·02	47	3·9	20 ,,	0·02	77	4·0
4	15 ,,	0·06	24	2·9	25 ,,	0·12	35	3·4
5	7 ,,	0·02	71	5·0	—	—	—	—
9	6 ,,	0·03	75	4·0	10½ ,,	0·06	99	4·7
10	12 ,,	0·06	23	2·7	20 ,,	0·10	47	3·4

GENERAL CONCLUSIONS.

1. It is possible to obtain considerable decrease in grain size by the use of a suitable developer.
2. All the commercial developers capable of doing this appear to be of the paraphenylene-diamine-glycine type.
3. It is possible to get a negative of normal gradation.
4. It is not possible to get a contrasty negative.

5. Development is considerably prolonged.
6. There is generally more fog than with normal developers.
7. There is a tendency for loss of speed, but the developers show considerable variation in this respect.

—B.J., 1936, June 12, p. 368.

Ortho-phenylene-diamine for Fine-grain Development.—A. Seyewetz, of the Lumière laboratories, in a lecture stated that this compound enables developers to be prepared which possess the same qualities as those obtained by the use of its para-isomer, but which does not blacken the fingers, is not changed in air either in the solid form or in solution, and which does not in the course of time give a precipitate of hydramine (a molecular compound of hydroquinone and p-phenylene-diamine, sparingly soluble in solutions of sulphite), as does the developer "Supermicros." Development is a little slower than with the para-derivative; the same time of development has been maintained in the corresponding developers formerly recommended by reducing the concentration of bromide.

	No. 1.	No. 2.
Water	1,000 c.c.s.	1,000 c.c.s.
o-phenylene-diamine	10 gms.	5 gms.
Metol	5 gms.	10 gms.
Hydroquinone	—	1.5 gms.
Sodium sulphite (anhydrous) ...	60 gms.	60 gms.
Tribasic sodium phosphate ...	3.5 gms.	5 gms.
Potassium bromide (10% soln.)	7 c.c.s.	7 c.c.s.

The formula No. 2 is that of the developer "Lumimicros." The time of development must not exceed the limits indicated below with respect to temperature.

Temperature	16 degs. C.	18 degs. C.	20 degs. C.
Maximum Time	18 min.	13 min.	9½ min.

With developer No. 1 the normal time at 18 degs. C. is 7 minutes.—"Science et Industries Photographiques," Vol. VII, May, 1936, p. 191.—B.J., 1936, July 31, p. 487.

Metol-Glycin for Fine Grain Development.—R. B. Willcock points out that in many respects glycin is the perfect developer, since it is clean-working, dissolves in the salts which hinder other developing agents, and is to some extent compensating. It has the advantage of suffering no loss of characteristic image density power by great dilution, and, furthermore, is comparatively slowly oxidised when greatly diluted. It has however, the disadvantage of being a low potential reducer, and as such has a threshold value little above that of hydro-

quinone, but on the other hand its fine-grain qualities are well known. When used for tank development of long duration, glycin produces on some emulsions a yellow stain if the sodium sulphite content is high, hence any thought of using the latter substance for the further reduction of grain, by its solvent action on the silver halides, is inadmissible.

The writer suggests that the combination of glycin with metol gives a developer which is considerably superior to metol alone, and gives the following formulæ as being typically practical in that they contain the two substances combined in such proportions as to yield the two qualities of clean density-giving power, and a good threshold value. They are thus worthy of a trial by miniature workers.

	Contrast		*Soft*	
Metol	15 grains	1 gm.	30 grains	2 gm.
Glycin	360 grains	25 gm.	360 grains	25 gm.
Sodium sulphite (cryst.) ...	8 ounces	250 gm.	8 ounces	250 gm.
Sodium carbonate (cryst.) ...	3 ounces	95 gm.	2 ounces	60 gm.
Water	160 ounces	5,000 cc.	160 ounces	5,000 cc.

Development time in both cases, 15 min. at 65 deg. F.

Comparisons were made with greater sulphite concentration, but no advantage was apparent, though some scum stain showed. No tank fog was evident, even with accidental long immersion, and the image grain was exceedingly small. In preparing the solutions the metol should be dissolved first, then the sulphite, followed by the carbonate, leaving until last the glycin, which is sparingly soluble in water only.

There is not, apparently, the same partial combination between metol and glycin as is evidenced in the case of metol and hydroquinone, and each seems capable of contributing its individual characteristics to the final developed image. Since there is no appreciable fog, even with ultra-rapid emulsions, no bromide is included. The temperature coefficient is approximately 1·8 for a variation of 10 deg. F.—B.J., 1936, Sept. 11, p. 576.

Comparison of Sease No. 3 and Metol.—M. Namias has experimented with the p-phenylene-diamine-glycin developer known as Sease No. 3, the formula for which is given on page 315, and confirms that this developer undeniably reduces grain size. He has compared it with a developer which he himself has suggested, and which consists of :—

Metol	5 gms.
Sodium sulphite (anhydrous)	50 gms.
Sodium carbonate (anhydrous)... ...	2 gms.
Water, to make	1,000 c.c.s.

He states that this latter solution allows an exposure one quarter the amount necessary for the former. The images formed by the Sease developer, according to the experimenter, are very transparent and lacking in contrast; they appear dichroic, in the same way as images produced by physical development. M. Namias considers that the Sease developer certainly deserves the attention of photographers, but it is not suitable for use with negatives which have received a bare minimum of exposure. When the utmost detail in the shadows is to be secured a developer containing metol is to be preferred.—B.J., 1936, October 2, p. 632.

Maxims in Fine-Grain Development.—R. B. Willcock, in a résumé of his experiences over a number of years in the matter of fine-grain development, exclusive of physical development, summarises the problem as follows. Super-speed emulsions can be employed in conjunction with paraphenylene-diamine, the result being tantamount to a considerable reduction in speed, or, alternatively, slower emulsions can be used in conjunction with normal developers of high activity, carefully adjusted to prevent the growth of the grain, or reduce its size. If the twofold efficiency of a fine-grain developer is to be judged by its simplicity of application, and its ability to operate without penalising the user of tiny films, there are few organic developers to choose from; these are: glycin, para-aminophenol, metol, and the latter in combination with hydroquinone.

Glycin stands alone as the only compensating developer. Many of the formulae mentioned to-day, however, are unsuitable for use with modern emulsions, for which no dilution should be made requiring more than half an hour for tank development. Glycin, though easily soluble in it, will not tolerate large concentrations of sodium sulphite, hence any form of von Hübl paste is undesirable for slow development. Many failures with gylcin are directly due to the inclusion of too much sodium sulphite, the amount of which should not exceed twice that of the glycin. Temperature should not exceed 60 deg. F., beyond which some stain and flatness of the image may result. The formula recommended is that given by the writer in the "B.J. Almanac" for 1932.

HAUFF.

Glycin	25 grs.	2 gm.
Sodium sulphite ...	25 grs.	2 gm.
Sodium carbonate ...	375 grs.	30·5 gm.
Water	28 ozs.	1,000 c.c.

30 minutes at 60 deg. F.

Do not add water to make up lowered tank level, and discard after use.

Several months' experiment with metol, alone and in combination with hydroquinone, convinced the writer that the inclusion of sodium sulphite in quantities large enough to exert a solvent action on the emulsion grains is of very doubtful value. A contributory cause of graininess is pronounced fog, which may be due to the nature of the formula employed, or extraneous light. Hence any means of preventing it will assist in keeping the grain size down.

Particularly in the case of hydroquinone developers, a considerable quantity of sulphite is desirable to keep down inherent fog. This is strictly apart from the inclusion of potassium bromide, which functions differently, and contrary to some opinions is absolutely essential in fine-grain tank developers excepting glycin. With metol, which is a clean-working and relatively fog-free developer, a considerable amount of sulphite is required to prevent slight veiling during long development at moderately high temperatures.

Para-aminophenol developers have been condemned by some as incapable of producing fine-grain negatives, but experience shows otherwise. Azol, for instance, diluted to 1 in 30, will produce fine grain and excellent gradation on most super-speed materials, which makes one wonder why it is not used more for this purpose. Such developers benefit greatly by the addition of sodium sulphite to the working solution, as also by small quantities of potassium bromide.

Over a number of years the writer has tried almost every formula published, and the experience gained, fortified by the experiments mentioned, has eliminated them to three, i.e., that of Morse and White, the D 76, and the Agfa 14. In certain instances which can be decided by the user, the addition of potassium bromide where none is specified, and the addition of one grain of potassium iodide per 20-oz. of tank solution, will materially assist in keeping down fog.

Most vital of all are the physical conditions. Temperature should not exceed 60 deg. F. Try out the selected developer with the sensitive materials habitually used. Employ dilute solutions, and test for time of fog-point exposing to give required development just below this. Use economical tanks

and discard developer after use, particularly glycin, which becomes opalescent. Avoid acetic acid fixing baths; use hypo and potassium metabisulphite, and if hardening is necessary add chrome alum (see Ilford handbook of formulae). Prepare developers well in advance of time of using: do not filter, but allow to stand a few days, then carefully decant, leaving sediment at the bottom of the bottle. Wash films quickly and thoroughly, using coarse grit filter on tap. Do not swab over the film surface, rinse both sides. Dry films slowly out of the way of dust, preferably in a cupboard.—B.J. 1936, Apr. 10, p. 226.

INTENSIFICATION, REDUCTION, TONING.

Physical Reduction.—L. M. A. Roy, in "American Photography," gives some useful advice on reduction by abrasion. Any fine abrasive powder will answer well, provided it is used with a suitable vehicle, such as methylated spirit or oil. A tuft of absorbent cotton, or a piece of soft fabric stretched over the finger-tip, thoroughly moistened with spirit and then dipped in the powder, or a fine paper stump, used in the same way, works well. The method most strongly recommended is to prepare an abrasive paste. This consists of one part vaseline to about four parts of very finely powdered pumice stone. This is used without any spirit or other addition, and in the same manner as described for using abrasive powder with spirit. A caution is added; in reduction by abrasion, always work slowly.—B.J., 1936, Jan. 3.

The Unreliability of the Persulphate Reducer.—"Fotografische Rundschau" explains the reason for the effect exercised by the addition of potassium permanganate to the ammonium persulphate reducer, which is well-known to be irregular in its action. The explanation given is that persulphate of itself attacks silver very slowly, but that its action is greatly accelerated by the presence of the very silver ions which its own attack produces—an obviously unstable state of affairs. Acid permanganate readily attacks silver, so that its addition—in a very dilute state—has the effect of immediately freeing, in the neighbourhood of every single silver grain in the negative, the necessary silver ions to facilitate the immediate attack of the persulphate, which then proceeds in a regular manner under full control. At the same time the combined reducer becomes, in fact, a proportionate reducer. The formula will be found on p. 328. The reducer also reduces the size of the silver grains, and may therefore be used to improve miniature negative grain.—B.J., 1936, Jan. 31, p. 70.

Intensifying "Chrome" Films.—The difficulty of intensifying Isochrome films with chromium intensifier has been pointed out by Frank Smith. He complains that the clear parts of the film turn a vivid magenta red, the silver image remaining untouched, but finds that the difficulty can be overcome by removing the film, after a few minutes' immersion in the intensifier, to an ordinary bromoil bleacher (Syme's formula). The image bleaches rapidly and although the red tint persists, a solution of sodium sulphite will remove it. Subsequent redevelopment appears to give good and even intensification.—B.J., 1936, July 17, p. 460.

After Treatment of Colour Transparencies.—In order to improve colour transparencies which are veiled, a series of operations in which the transparency is successively bleached, cleared, and intensified, has been worked out by Almara. The bleaching bath is as follows :—

A.	Potassium bichromate ...	25 gms.
	Water	1,000 c.c.s.
B.	Hydrochloric acid (conc.) ...	50 c.c.s.
	Water	1,000 c.c.s.

Varying degrees of intensification may be obtained by adding more or less acid, the maximum effect being given when the least amount of acid is used, the bath for this being made up in the proportion of 10 parts "A," 1 part "B," 3 parts water. After bleaching the yellow bichromate stain should be removed in a ten per cent. solution of potassium metabisulphite, or an acid sulphite bath. The transparency is now reduced (or cleared) in a bath containing 0·5 per cent. of hypo, until the high-lights are clear, after which it is well washed and re-developed in diffused daylight, or artificial light, in a non-staining developer such as Amidol or M.Q. A short wash completes the process.—B.J., 1936, Feb. 28, pp. 132-133.

Toning with Nickel Compounds.—G. Nilsson describes a method of toning silver images with nickel.

A.	Nickel nitrate	5 gms.
	Potassium citrate	15 gms.
	Water	100 c.c.s.
B.	Potassium ferricyanide ...	2 gms.
	Water	50 c.c.s.
C.	Dimethyl-glyoxime (saturated solution in methyl alcohol)	5 c.c.s.
	Sodium hydroxide (0·4%) ...	5 c.c.s.
	Water	50 c.c.s.

To obtain red tones the silver image is first bleached in a freshly prepared mixture of solutions A and B, acidified with a little nitric acid and then placed for two or three minutes in solution C, to which are added five or six drops of ammonia. The prints are finally fixed in an ordinary fixing bath. This gives a bright red image. If the red toned print is treated after fixing with a slightly acidified solution of ferric sulphate and potassium bromide, violet tones are obtained. To obtain a red-brown tone, the red toned print is treated with a solution of sodium sulphide. In this case it is advisable to add 0·5 gm. of potassium bromide to solution A.—Nor. Tids. Fot., 20, 9-11, Jan., 1936.—B.J., Aug. 7, p. 503.

Toning with Polysulphides.—H. Cuisinier summarises the uses of the polysulphides in toning silver images. Sodium polysulphide, which is used for toning silver chloro-bromide papers, has already been discussed by J. Desalme (1913). It is obtained by adding sulphur to a solution of sodium monosulphide. The following proportions give the bisulphide: sodium monosulphide, 50 gm.; water to make 60 c.c.s. To this solution, at boiling point, add 6 gm. of flowers of sulphur in small quantities, and for use make up to 1 litre with water. Sodium trisulphide is obtained by doubling the proportion of sulphur. The solution of sodium bisulphide is convenient for papers which readily give warm tones, whilst the trisulphide is to be preferred for toning papers which give colder tones. It sometimes happens that the colour does not change in the course of toning, but only in washing. As a rule it is necessary to limit the time of immersion of the papers to thirty minutes in the bath used. Sodium polysulphide toning baths, of which the smell is quite tolerable, give quite agreeable tones; their use, however, is not practical. When cold, they tone slowly, and raising their temperature makes them scarcely any more rapid. They are caustic, sometimes disintegrating the paper base of the prints, and their use frequently causes corrosion of the skin or nails. Moreover, they sometimes stain indelibly the whites of the paper. Solutions of potassium polysulphide (liver of sulphur) are much more useful and are non-caustic, of scarcely any smell, and easy to work with. They allow, on raising the temperature to about 40 degs. C., the majority of chloro-bromide papers to be toned in two or three minutes, whether washed or not. On adding selenium to it in the form of sodium selenosulphide, it is possible to make variations in tone.—Revue Francaise de Photographie et de Cinématographie, No. 369, June 15, 1936, p. 190.—B.J., 1936, July 24, p. 471.

APPARATUS.

A Direct Vision Finder for Press Cameras.—In order to overcome the necessity for using a back sight with the wire frame type of viewfinder, which constitutes a danger to those who wear glasses, the finder shown in the illustrations has been suggested by F. O. Stead. The large frame is cut from sheet brass (strong wire would serve equally well) to such a size and proportion that the correct angle of view is seen through it on a five-yard shot with the eye at nose length from the back of the camera. To facilitate this a pattern is made in cardboard for the subsequent brass frame. Centering is not important at this stage, but the angle of vision must be correct and may be checked by means of the ground glass screen. The proper distance from eye to frame is set by placing the tip of the nose against the camera in the way most comfortable to the individual. It will be found in practice that the eye and nose will occupy practically an identical position when subsequent exposures are made. To obtain correct centering the brass rod is held vertical, radiating from the centre of the lens, and the height so adjusted that the top appears in the centre of the $\frac{1}{4}$-in. diam. brass ring suspended by means of fine brass wire in the centre of the rectangular frame, whilst the view included in the latter corresponds with the image on the screen on a five-yard shot. The position and height of the rod is marked and then fixed in position as shown in the diagram. The arm (A) bears against the screw (B) when in the upright position. The rect-

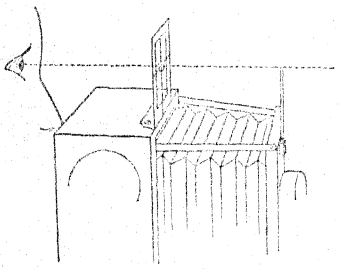


Fig. 1.

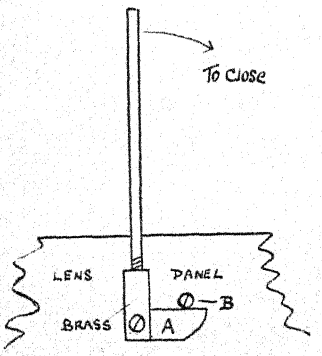
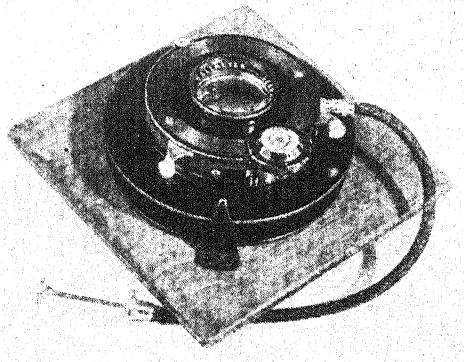


Fig. 2. Detail of Verticle Rod

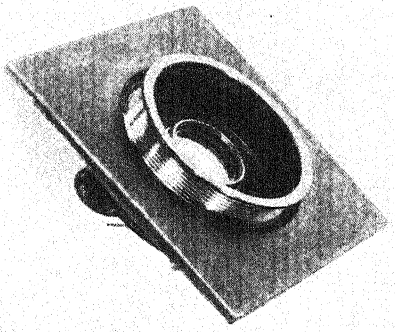
angular frame is hinged to fold down on the body of the camera when not in use. A point in favour of this type of finder is that when the rising or cross front is used the vertical rod moves with it. The model illustrated was fitted to a quarter-plate T.P. Press camera, and may need modification for other types.—B.J., 1936, Sept. 11, p. 582.

An "Angle-camera" Attachment.—In order to adapt a camera of the Kodak "Angle-camera" type so that it may be utilised in an emergency for other purposes for which it is not normally designed, David Charles advocates the fitting of a 3½ ins. *f*/4·5 Dallmeyer Serrac lens mounted in a between-lens shutter. He suggests that the camera may thus be utilised for obtaining unexpectedly required action pictures or the like, which could not otherwise be obtained unless an extra camera had been brought.



The lens and shutter is mounted in a specially constructed focussing mount fitted to a panel which is interchangeable with the normal wide-angle lens belonging to the camera. The virtue of this mount lies in its great diameter, and it does not, when extended for a near subject, cut off the margin of the field, as most focussing mounts do. The mount consists of a short piece of large diameter tube, with a screw thread on the outside, which screws bodily in and out through the flange on the panel. In order to prevent any light leaking through the screw thread a lip or flange is provided on both outer and inner ends of the tube. On the outside end the whole tube is closed by a flat

plate, except for the comparatively small hole in the centre into which the lens screws. The illustrations will make this clear. The focussing-tube is 2 ins. in diameter, and is $\frac{5}{8}$ in. deep from front to back. When screwed right back the setting is arranged so that the lens is at infinity, and the hole in the wood panel is just large enough to let the back lip of the tube go right through up to the flange when screwed forward, thus getting the whole advantage of the focussing-tube, and allowing of photographing an object as near as two feet at open aperture, if required. The pointed projection on the lens panel is for two purposes, namely to provide a spring which prevents the rather shallow focussing-tube from any chance rocking, and also a surface on which marks can be made for focussing by distance, if necessity arises.



It is by no means suggested that it would not be preferable to use a normal camera for non-angle subjects but the arrangement which has been described is capable of giving a usable image over most of a half-plate and can be used on occasion when another camera is not available.—B.J., 1936, Sept. 18, pp. 595-596.

Preventing Tripod Slip.—A device for preventing the tripod from slipping on polished surfaces has been suggested by J. H. Russell. It consists of a piece of wood $1\frac{1}{2}$ in. square to which a rubber heel of the same diameter is screwed. One of these wood and rubber blocks is attached to each leg of the tripod in the following way. A piece of brass about $\frac{3}{4}$ in. wide and 3 in. long, bent as shown is screwed loosely to the wood block, the top $\frac{3}{4}$ in. being bent down double. A piece of clock spring, also about $\frac{3}{4}$ in. wide is brought to a red heat in order to allow it to bend to the shape of the tripod leg without cracking. This piece of bent spring is held firmly to

the brass strip, without soldering or riveting by means of the upper turned-down portion of the latter. A hole is now made



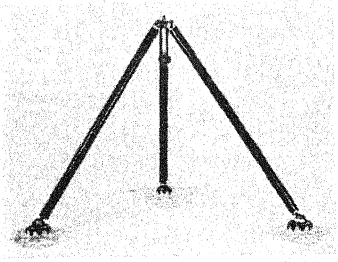


in each wooden block to take the tripod point, at about the angle at which the tripod leg usually meets the floor. The grip of the spring is sufficient to ensure that the fitting remains on the tripod when the latter is lifted.—B.J., 1935, Nov. 22, p. 744.

Self-Adjusting Tripod Feet.—Self-adjusting, non-slip feet suitable for use with a telescopic tripod are shown in the illustrations, as described by George Wilkinson. They were constructed as follows :—

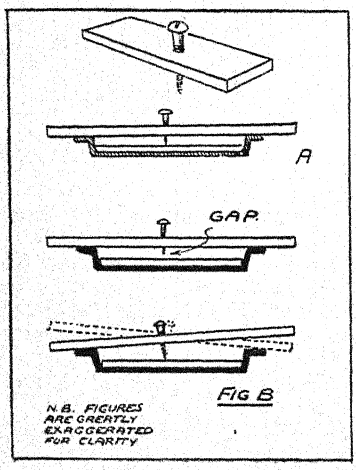


Three $\frac{1}{2}$ in. ball castors were obtained and each ball removed by raising the overturned joint of the flange of each castor. The balls were then softened by placing them in a fire and heating to a blood-red, and then allowing them to cool off slowly. When cold a hole for a $\frac{3}{16}$ in. thread was drilled and tapped, the balls being then polished with fine emery cloth and replaced in the castors. Next, three circular pieces of mild steel $1\frac{3}{4}$ in. diameter by $\frac{1}{16}$ in. thick were cut, the centre of each dented with a centre punch and an inner circle 1 in. diameter



scribed. In this $\frac{3}{8}$ in. margin eight teeth were cut with a hacksaw, each being bent individually with pliers as shown in the illustrations. To fasten the spiked discs to the castors a hole was drilled in the centre of each, large enough to pass over the boss of the castor. They were secured by means of rivets after they had been case-hardened. To fix the spiked castors to the tripod legs the brass parts of the latter were cut off and a hole drilled and tapped in the brass bush, the same size as that in the steel balls. Finally a $\frac{3}{16}$ in. piece of threaded brass was screwed tightly into each ball and the other end screwed into the foot of the tripod. For use on polished floors a round piece of rubber, slightly thicker than the depth of the feet, may be pressed tightly between the latter.—B.J., 1936, Jan. 24, p. 49.

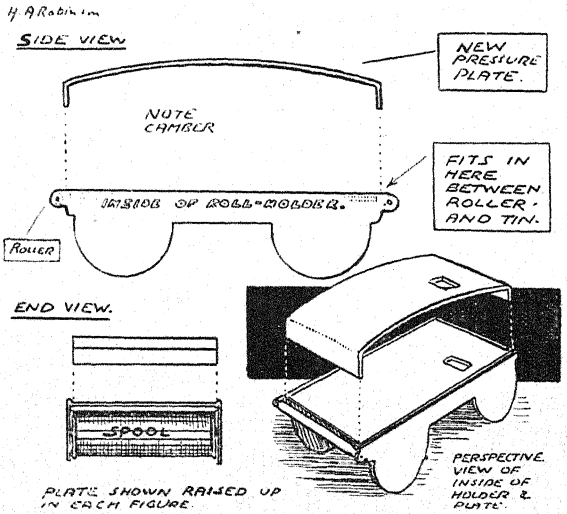
A Simple Way of Testing for Register.—H. A. Robinson describes a simple device for testing plate-holders and focussing screens for register. It consists of a perfectly flat slat of wood, a little longer than the width of the slide to be tested and about $\frac{1}{4}$ in. thick, and a $\frac{3}{4}$-in. screw of small diameter and shallow pitch. The screw is carefully inserted in the centre of the slat without splitting or warping it by first boring a hole of suitable size. The strip is placed across the runners of a slide, known to be correct for register, and the screw turned until the point just touches the film of an old plate inserted in the slide, as indicated by its slightly scratching it when moved sideways without, of course, exerting



the least pressure on it. On transferring the strip to the slide or screen to be tested, if the point still just scratches the film or surface of the screen, the register is correct. If the strip rocks as at B, the glass is in front of correct register; if there is a gap, it is behind register.—B.J., 1936, July 10, p. 435.

Improving Definition with Roll Holders.—A pressure plate is suggested by H. A. Robinson for the purpose of overcoming the poor definition which is often apparent when using a roll-holder, on account of the fact that the film may be held tightly back against the face plate over which it runs, or come forward against the guides.

The pressure plate is cut from a piece of springy tin to the

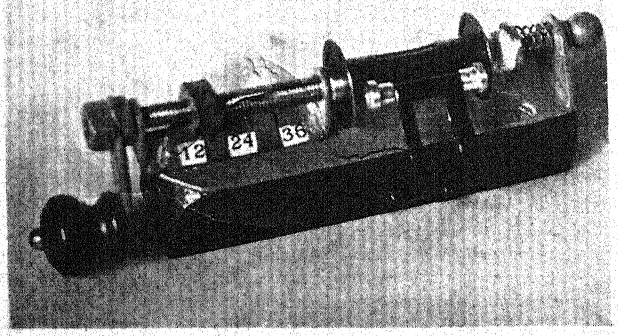


exact width of the existing face-plate and the two ends then bent down to right angles, so that they just slip in between the rollers and the tin. Care must be exercised to avoid the bent-up portion binding on the rollers and preventing them from rotating. As a flat plate the tin acts as packing but does not hold the film completely tight; and it is, therefore, given a bend from the middle down to the ends, as shown in the illustration, so that the film is apparently fed over a curved surface. The curve flattens out when the holder is closed, and the plate exerts a strong but springy pressure on to the

film right along its sides. A rectangle stamped out, corresponding with the red window for the numbers to be read, completes the attachment.

The attachment causes the film to lie as flat as possible, and although the film winds a little harder and tighter than usual, this is an advantage rather than otherwise. It is important to see that the pressure plate fits easily, and that the ends meet the rollers truly, otherwise the film may be pressed unduly against the edges of the mask when leaving the rectangle, thus causing lines to appear throughout the length of the film.—B.J., 1936, Sept. 25, p. 608.

A Simple Winding Device for Miniature Film.—One of the many advantages of buying standard 35 mm. film and loading-cassettes for use in miniature cameras is the possibility of employing short lengths of film, and not being confined to long lengths of thirty-six exposures, as supplied in daylight-loading packs. However, existing arrangements for cutting off the lengths of film are unsatisfactory as the film is liable to trail on the floor or bench, or to become finger-marked. Moreover they do not permit of the necessary accuracy in cutting off the desired number of exposures. Bernard Alfieri, Jun., describes a simple accessory for the purpose.



This device can be made from strip brass, and permanently fixed to the darkroom bench, or it can be mounted on a block, as shown in the accompanying photograph. It consists of a simple winder similar to the mechanical winders already on the

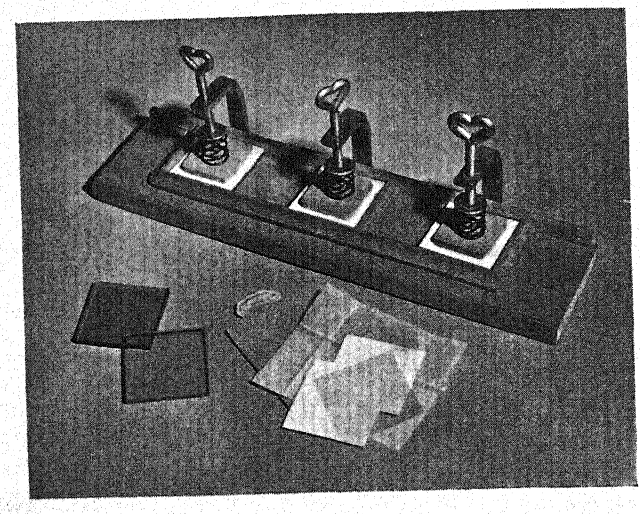
market, but provided with an extended spindle to the handle which is threaded. A nut which is free to travel in a longitudinal direction engages in the O B.A. thread and moves along a scale which can be marked for any given number of exposures. In daylight, before commencing operations, the handle is turned until a small pointer attached to the nut is opposite the number required, and the spool is placed in position. After turning out the light, it is only necessary to wind on the film until the nut has travelled the full length of the screw, when it becomes locked, and it is impossible to wind any further. The full thirty-eight turns are more than is required for thirty-six exposures.

At one end a simple spring clip can be contracted to allow the spool to be put into position, and the end of the screw-member is provided with a slot to engage with the pin in the spool and ensure that it turns with the handle. A separate spring roller, shown attached to the side, with ends of a larger diameter, prevents the film from unrolling when pressure is released, by pressing against the edges only of the film. An arm can be added on the side carrying a razor blade for cutting off the film. Owing to variations in spools of different make, either the pivots at each end must be tapered to allow for the different diameters, or the ends must be made to fit the smallest relying on the pressure of the spring to prevent undue lateral movement.—B.J., 1936, June 12, p. 372.

Preparing Coloured Gelatine Filters.—A simple method for cementing gelatine filters between glass is described by Stanley W. Bowler, additional suggestions being made by H. G. Drake-Brockman. Three types of glass may be obtained for the purpose, the first, ordinary patent plate which is usually good enough for ordinary photographic work but has a greenish appearance when seen in bulk. If a greater degree of accuracy is desired a similar patent plate may be obtained which is white when seen in bulk. For work of extreme accuracy optically flat glass must be used, and may be obtained from any recognised maker, cut, ground, and polished. The various types of glass vary considerably in price, that of flats being dependent upon the accuracy with which they are worked. Suitable gelatine may be obtained in sheet form from most wholesale houses.

A suitable material for cementing the gelatine filter between the squares of glass is canada balsam in a solution of xylene—this costs about 1s. per oz., this quantity being sufficient for a number of filters. An alternative is to use undiluted canada balsam which will flow easily on gently warming.

During the process of setting the complete sandwich of glass-gelatine-glass may be kept under an even pressure by means of the simple press shown in the illustration. This



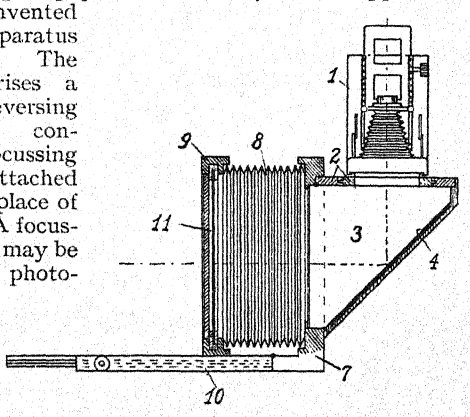
consists of a piece of oak, planed flat, and about two inches wider than the largest filter which is likely to be required. Two guides are fitted lengthwise along the board, separated sufficiently to allow the glass squares to drop between them without undue play. One cross-bar is added between these guides for each of the clamping spaces. Pressure on the filters is obtained by means of any desired number of carpenter's G-clamps, under each clamp-screw of which is fitted a washer, light spring, and a thin wooden pressure pad for equalising pressure.

The glass must now be thoroughly cleaned, placed on a flat surface, and sufficient balsam poured upon it to cover the surface. The gelatine is now laid down, one edge first, and slowly lowered so that all bubbles are excluded. Another pool of balsam is now flowed on it as before. The top glass is now added and excess balsam squeezed out with gentle pressure, the surplus being mopped up with rag. When the complete sandwich is fairly clean it may be placed in the press. A piece of clean blotting paper is first put down, then the filter, with another piece of blotting paper on top, then the pressure pad,

and finally the press is screwed down with the spiral spring and washer in place. The press may be stored in a linen cupboard where temperature is likely to be about 70 to 80° in which case the filter will take about a fortnight to set. Alternatively hardening may be speeded up by using higher temperatures up to about 120°.

H. G. Drake-Brockman suggests that the use of undiluted balsam avoids bubble formation arising through evaporation of the solvent at a later date, and also that the edges of the filter may be painted with a solution of asphaltum in turps.—B.J., 1936, June 12, pp. 370-1, July 10, p. 443.

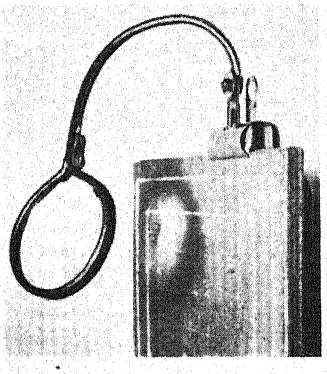
A Compact and Portable Direct Copying Apparatus.—In order to be able to take copies right-way round upon ordinary photographic paper, and with any normal apparatus, J. Brisch has invented the simple apparatus illustrated below. The apparatus comprises a simple sealed reversing reflector-housing, connected with a focussing device, which is attached to the camera in place of the usual slide. A focussing screen, which may be replaced by the photographic paper for exposure, is fixed at the point 11. The whole is made collapsible in order to facilitate transport in a compact form. (Patent No. 440,546, of January 1, 1936, by Josef Brisch. Bergstrasse 37, Berlin, N.4, Germany.)—B.J., 1936, April 3.



Darkroom Safelights for Infra-Red Material.—K. M. Kusminsky and A. N. Kusmenkov describe a method of preparing safelights for use when processing infra-red material. Glass plates are covered with the gelatine film of green and yellow dyes usual for this purpose and treated in addition with Berlin blue. This is obtained by the reaction between ferric chloride and potassium ferro cyanide in the following manner:—10 gm. gelatine and 4·56-gm. ferrocyanide are dissolved in 150 c.c.s. water. A solution of 2 gm. ferric

chloride in 50 c.c.s. water is then added at a temperature of 40 degs. C. with continual stirring. 13·5 c.c.s. of this solution are used for a 9 × 12 plate.—B.J., 1936, Aug. 7, p. 503.

A Flexible Magnifier Holder.—A method for flexibly mounting a magnifying glass on either the enlarger easel or the retouching desk, so that both hands may be left free is described by J. R. P. Hilliard. An ordinary unmounted bi-convex lens was obtained, together with half a yard of lead-covered twin electrical cable. The latter was straightened out flat along the bench and a groove was punched along it between the two internal wires with a blunt cold chisel, commencing ¾ in. from one end and continuing for a distance approximating the circumference of the lens. The cable was then bent tightly round the lens to form a frame, and clamped with a small screw bolt. The cable was then cut to a suitable length and the other end then clamped to the ring of a "Bull-dog" clip by means of another nut and bolt, washers being used to cover each side of the ring of the clip. The clip may be attached to any convenient projection and the magnifying glass bent to any desired position.—B.J., 1936, March 20, p. 178.



Posing Steps for the Studio.—L. G. Sandys has devised a simple studio accessory for posing full length portraits. It consists of two steps with a smaller top back portion. Fig. 1 shows the general appearance and Fig. 2 the construction of the supporting framework. This is of 2 × 2 ins. deal. The sketch in the lower corner of Fig. 2 shows the method of making the sound joint between the three pieces of timber which adequate strength of the finished job demands. A right-angle piece is cut out of the ends of the

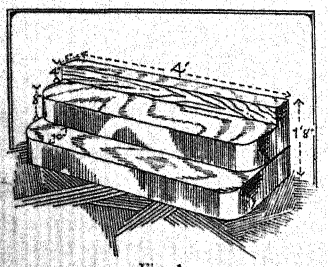


Fig. 1.

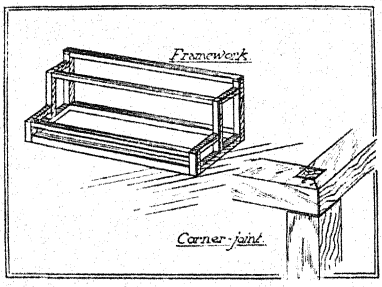
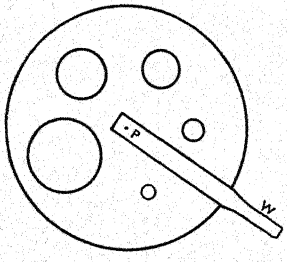


Fig. 2.

cross-bars, and the projecting ends mitred in a mitre block. The upright is cut to leave a square block on the inner side, and ledge, below, around and on to which, respectively, the mitred ends of the horizontal parts fit. Joints are made with 3½ in. nails or screws. The framework is covered with 1 in. boards, which overlap the framework about 2 ins. so that the square corners can be rounded off. All parts other than the treads are covered with three-ply board, which is bent round the corners and nailed in place. The whole is covered with good quality linoleum—three square yards are ample for the dimensions given—the pattern being carefully chosen to be in harmony with the general run of subjects. An all-over mottled pattern of blue or light grey will be found very suitable.—B.J., 1936, April 10, pp. 230-231.

A Shading Device for the Enlarger.—J. C. Gill recommends the use of a permanent shading device to replace the usual odd piece of card for printing up local detail. It is made from a piece of card about 15 ins. × 12 ins. such as the lid of a bromide paper box. A smaller piece of card, a strip of wood about 3 ins. long, and a paper-fastener or a screw are the only other materials necessary.

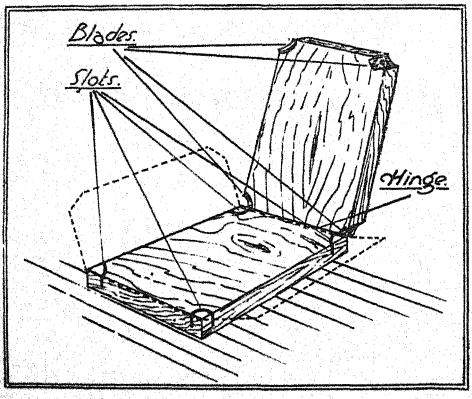


About 5 ins. from one end of the large card, and a little to the right, cut out a circle 1½ in. diameter. This forms the base of the shader. The smaller piece of card should be cut to form a circle 5 ins. diameter. From this cut out circles ranging from 1½ in. to ¼ in. diameter, as shown in the illustration. A strip of wood can be glued to this card to form a handle, as shown.

When this is dry, attach the whole thing to the large card, either by means of the large paper-fastener or by a screw into a small block of wood at the back. Make sure that the largest circle on the movable piece coincides exactly with the

hole in the large card. By means of the rotating card an aperture of any required size can be obtained, and any degree of diffusion is obtainable by moving it nearer to, or farther from, the lens.—B.J., 1936, March 6, p. 146.

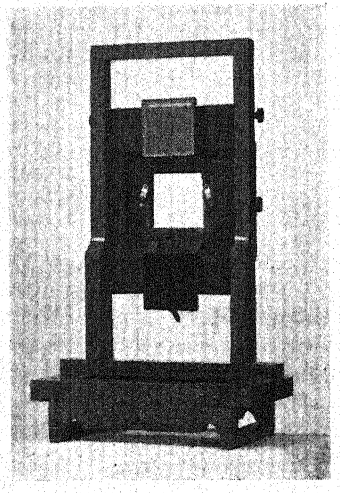
Christmas Folder Making.—A device for positioning and cutting the corner slits in Christmas folders as suggested by Leslie G. Sandys is illustrated in the accompanying diagram. It is made by cutting two blocks of wood, about 1 in. thick to such a size that they will just fit inside the print space portion of the folder into which slits are to be cut. In the top piece it will be seen from the illustration that the corners are cut out in semi-circular style. The simplest way to do this is to drill a 1-in. hole before the block is cut, in such a position that when the outer pieces are removed only the semi-circular corners remain out of the holes. For actually cutting the slits Gillette pattern razor-blades are used, which are made the correct size by breaking off the ends with a pair of pliers. It will be found that, when the ends have been removed, the portion which remains has one hole of the three left in the centre. This is employed to fix the blade to the top block by means of a screw, so that it will be a simple matter to replace it when it gets too blunt for efficient working. The semicircular nature of the corners will bend the blades to their shape when the screws are driven firmly home, and this will ensure that the slits are cut in the folders in the curved manner instead of straight, as they would have to be if the blades were used by hand. A cutting device may be made in this manner for every size of folder which it is wished to make, for the actual corners are all the same size. So that the blades can travel right through the folder and thus ensure a clean cut, the bottom part of the device is provided with slots (shown in the drawing) into which the blades pass after they have



cut through the board. These slots should only be wide enough to allow the blade to enter easily. The device is finished off by fixing the two portions together with a hinge which may quite well be made of leather tacked strongly in place.

Cutting out the folder boards to size previously to cutting the slits is best accomplished by first marking out and cutting to size a piece of thick board, so that this can be used as a cutting guide for all folders of a given size.—B.J., 1936, October 16, pp. 659-660.

A Lantern Slide Printing Easel.—R. V. Dent describes a method which he has worked out for printing lantern slides by projection. The type of easel used is made clear by the illustration and consists of a wooden slide holder which is capable of a four-ways slide, up-down and side-ways, the movement being some two inches either way. The image may be critically focussed by means of a down-swinging focussing screen which fits exactly into the opening, with the ground side to the lens. The slide itself may be held in exactly the same plane and position by means of an upward-swinging panel which fits against a narrow metal rebate. Prior to critical focussing framing is accomplished by inserting one of a series of masks in the slide holder. The masks are made by first gluing a piece of good white paper on to a cleaned off lantern plate and using this as a base on which to mount the masks. A series of about ten different shapes are adopted as standard. When framing has been completed a critical focus is obtained on the ground glass with the aid of a magnifier, and exposure is then made by substituting a slide for the focussing screen. When mounting the slides a ready-prepared, square cornered mask is used of similar shape to that employed when framing.—B.J., 1936, July 17, pp. 453-454.



OPERATING AND WORKROOM HINTS.

Compressing the Camera Extension.—It is occasionally the case that one desires, for extreme wide-angle purposes, a slightly shorter extension than the camera is built to give. It may be, for instance, that a lens from a smaller size of camera would just include the view if only a slight decrease of extension on the larger camera permitted; or it might be that the normal wide-angle lens might satisfactorily include the desired amount of subject if it could be taken closer to the plate and then well stopped-down to provide the necessary correction for "focus." This may be sometimes achieved by turning the lens-panel so that the objective projects inside the camera instead of outside. To stop down in such a case, obviously the lens must be taken out and be put back again, but one usually knows which stop will do the work, without the necessity for examination of the image after the first focussing. Exposure can be made, since it is sure to be a long one, by the crude but effective method of lifting the focussing-cloth up and then down. In the case of a field-camera, when the desired decrease of extension is only slight, a less obvious method is often effective. The back is swung well back, and the front tripod leg lowered until the back is upright again. Then the camera front is swung until it is upright also. An unexpected shortening of the extension will be found to have taken place. Both methods in combination will obviously give a comparatively substantial reduction in the space between lens and emulsion.—B.J., 1936, May 22, p. 318.

Burning Shutter Fabric.—Brian O'Dale draws attention to the danger of leaving a camera which is equipped with a focal-plane shutter, in direct sunlight, with the lens uncapped. The lens acts as a burning glass in such circumstances, and by focussing a small image of the sun on the blind, even a short exposure is liable to burn a hole, whilst a long one will almost certainly irretrievably ruin the fabric.—B.J., 1936, March 6, pp. 146-147.

Copying Prints on Rough Paper.—P. C. Smethurst describes a method of avoiding the reproduction of the paper grain when copying rough prints. The print to be copied is pinned to a board, which is then set up at the window so that it is in shadow, and only lit by the reflected light from the walls of the room. The exposure is necessarily long, but the result is very satisfactory.—B.J., 1936, July 31, p. 490.

Home-Made Cloud Backgrounds.—Cloud backgrounds for special purposes in either portrait or commercial work can be quite simply and easily made in a way described in "The Professional Photographer" (U.S.A.) by B. L. Kobel. Unbleached muslin is tacked on to a frame with a suitable base, and is then sprayed with a spray-gun such as is used for spraying insecticides; in this way brush-marks are avoided. The spraying liquid is made by dissolving half a pound of glue in a pint of boiling water and adding to it three ounces of yellow laundry soap and a pound of whiting. When this is thoroughly mixed, add lamp-black to give the shade of grey desired, which may be varied from light grey to jet black. To save the floor from being stained whilst working it as well to spread newspapers.—B.J., 1936, July 24.

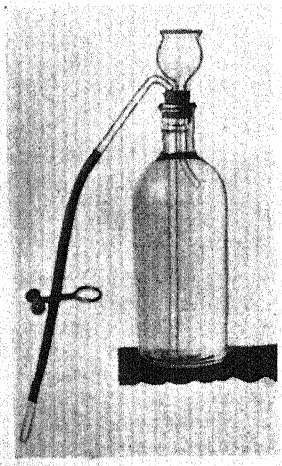
Enlarging with Mercury Vapour.—An opinion is expressed by G. Marshall Smith that the flattening of enlargements made with a non-condensed light source such as mercury vapour, is often due to the fact that extraneous or reflected light is allowed to reach the lens. As a remedy he suggests fitting diaphragms of cardboard cut to fit loosely in the folds of the bellows, the correct size for these being found by trial and error. Similar baffles may be required for wooden extensions to the enlarger used for reducing. Extraneous light from the clear rebate of the negative may be stopped by gluing thin strips of card all round the rebates of the carriers and thus increasing their width. One of the chief causes of flattening, he considers is due to the fact that many workers habitually make their negatives too thin when they propose to use this type of lighting.—B.J., 1936, Jan. 17, p. 33.

The Prevention of Moulds in Photographic Solutions.—J. F. Stirling suggests a remedy for moulds caused by the growth of the organism *Penicillium glaucum* in photographic solutions, e.g., of citric acid, citrates and bromides. The presence of pyro is itself a preventive, as also to some extent that of alum or thiocarbamide. A few drops of 10 per cent. mercuric chloride is a certain preventive, but its use is objectionable both photographically and because of its poisonous nature. Formalin is therefore recommended in a strength of 3 drops of strong commercial formalin to a pint of solution.—B.J., 1936, June 26, p. 402.

Dr. H. E. Durham prefers carbolic acid in inhibitory, not bactericidal quantity, but in the case of citric acid recommends rather raising the acidity, using a stock solution of citric acid, 50 gms.; iron-free hydrochloric acid, 50 c.c.s.; water, 500 c.c.s.—B.J., 1936, July 24, p. 474.

Two Hints for Keeping Used Developers.—R. V. Dent suggests that the condition of a developing solution that is used only occasionally can best be maintained and checked by a combination of two simple devices. Firstly the bottle is always kept filled, and air excluded and oxidation prevented, by the simple expedient of adding glass marbles as the level of liquid in the bottle falls. To ensure constancy of results, his second suggestion is the provision of a neat little celluloid envelope containing a series of numbered cards which indicate how many times the solution has been used and hence the correct developing time. All one has to do is to take out the front card and insert it at the rear, and when the numbers come round again the solution is discarded.—B.J., 1936, March 6, p. 155.

A Self-siphon Bottle.—Several variations of self-siphon bottles which enable solutions to be drawn off without removing the bottle from its shelf are described by David Charles. One of these is shown in the accompanying illustration. Such an arrangement allows small and exact quantities of liquid to be drawn off at will, ensures cleanliness of shelves, and is a particularly useful method for storing solutions of such poisons as cyanide and mercury.



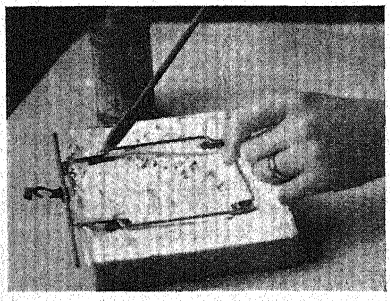
The bottle shown in the illustration is fitted with a cork containing two holes, one to accommodate a bent glass tube having a rubber tube extension which is in turn fitted with a pinchcock, and the other a glass "thistle funnel." The bottle is filled with solution in the usual way and the cork with its accompanying tubes then placed in the neck. In order to obtain any desired quantity of the solution a measure is placed under the tube, the pinchcock squeezed between finger and thumb, and at the same time a little spare solution is poured gently into the mouth of the funnel. The siphon immediately starts working and solution commences to run from the tube until such time as the pinchcock is released. Plain water may often be used for starting the siphon for with many photographic solutions the amount which is added will be so minute as to be negligible.

The funnel may be closed with either a cork or a cover of some sort but it must not be air-tight otherwise the siphon will cease to function.

Alternatively, instead of the thistle-funnel, a plain tube of similar length may be used, the top end of which is bent outwards in the same direction as its lower end inside the bottle. In this case it is only necessary to tilt the bottle forward in order to start the siphon. This arrangement, however, requires a wide-mouthed bottle in order that the holes may be spaced fairly wide apart.

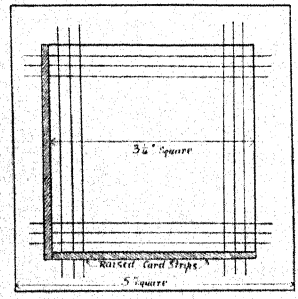
Another variation is to make use of a wide-mouthed bottle and to retain the thistle-funnel which may, in this instance, advantageously be of larger size. A third hole in the cork is necessary for accommodating a piece of glass tube which should stand higher than the funnel but should not project downwards into the bottle. This tube provides an air vent and allows the contents of the bottle to be introduced through the funnel without either removing the stopper with its tubes or releasing the pinchcock. Provided the bottle is filled until the contents fill the thistle-funnel the flow should commence at any subsequent time upon release of the pinchcock. The last system has the advantage that the bottle need never be moved since it is filled through the funnel and emptied by the siphon.—B.J., 1936, October 9, p. 646.

Repairing Film-Hangers.—Film-hangers for flat film are very liable to come apart where the metal clips are soldered to the frames, and it is not at all an easy matter to fix them in just the correct position. Bernard Alfieri, Jun., suggests a very simple way of overcoming the difficulty. Obtain a shallow box and fill it with plaster of Paris or cement, and just before it sets, press one of the undamaged hangers into the soft surface and gently remove it, leaving the impression in the form of a mould. When the cement is quite dry, it is easy to place any detached part of a hanger in the mould, which will hold it in the correct position to the frame ready for soldering.—B.J., 1935, Nov. 22, p. 745.



Stereograms from Hard Negatives.—H. A. Robinson makes use of the following method for obtaining stereograms from hard negatives, and claims that it will often prove the means of saving an otherwise hopeless pair of negatives. A print is first made on P.O.P. from one of the negatives in such a way that all detail is preserved in the high-lights whilst the shadows and under exposed areas are allowed to blacken up. Contrasty gaslight paper is used for the other negative, which is printed in the opposite manner, so that as much detail as possible is preserved in the shadows, the high-lights often remaining pure white. This pair of prints, if viewed in the ordinary way will, when superimposed, be found to incorporate the good qualities of each print.—B.J., 1935, Dec. 27, p. 821.

Masking Lantern Slides.—By using a piece of white card, ruled as shown in the illustration, and fitted with two raised strips of card of the same thickness as a lantern plate, to form a right-angle stop, R. R. Rawkins shows how masks of any rectangular size and shape may be built up from binding strips. The lantern slide is placed in the holder film side up so that the ruled lines are visible through it. Binding strips are cut to convenient lengths and are then wetted and lowered on to the film in the correct position as indicated by the black lines.—B.J., 1935, Dec. 27, p. 821.



Titling Negatives.—In order to avoid the difficulty of writing on the negative in reverse for the purpose of titling it, H. A. Robinson writes the required title on glazed paper, with copying ink and a clean pen, and then transfers it to the negative. The procedure is as follows:—After the title has been written and thoroughly dried by heat, the negative is placed for a few seconds in a dish of cold water, following which it is wiped over with a wash-leather and placed on something firm, film side up. The title is now placed face downwards on the negative, in the position required, and then gently rubbed into contact. If correctly carried out the impression will be clean and of good printing quality.—B.J., 1936, July 17, p. 455.

CINEMATOGRAPHY.

Cameras, etc.—The progress in cinematography during the past year has not been marked by any very spectacular achievements, but has rather been maintained by a steady advance in all the branches of the art. The developments have been mainly of the type which are engendered by a striving to improve or to perfect existing apparatus which has already shown its value in routine production. Colour still seems to claim more interest than is perhaps justified, but this may be merely traditional.

In the B.J., Sept. 1935, p. 570, mention is made of two patents relating to camera design by Vinten. The first deals with a new method of setting out the axes of the lenses on a turret model camera so that a long focus lens does not foul one of shorter focus. The second relates to an improved mouth for film magazines for expediting loading and dispensing with the usual velvet light-trapping. It is understood that this firm have also been dealing with colour cameras for different processes and for television work. In Adrian Klein's new book on Colour Cinematography, reviewed in the B.J., 1936, Oct. 9, p. 649, a description is given of the new Technicolor camera, together with operating details and an outline of the method of construction. The design incorporates many of the patents which have been listed in the Journal during the past year. A remote control device for the focussing of this camera by means of Selsyn interlock motors is described by W. Stull, in Amer. Cine. Feb., 1936, pp. 53 and 60. An entirely new departure in silent camera design is the 20th Century model which is described in Amer. Cine. Dec., 1935, pp. 516-517 and 520, and reviewed in the J.S.M.P.E. July, 1936, **27**, No. 1, p. 9. The partial rotation of the camera body for the focussing shift is unusual and the rest of the design commands attention. In the former Journal, Sept., 1936, pp. 370-371, Hal Mohr describes the way in which he overcomes the difficulty in photographing certain scenes that call for a great depth of focus, and which really need a "swing-back." The idea used is that of mounting the lens assembly, complete with focussing jacket, in a ball-and-socket fitting, with a control device suitably calibrated, and carried on the camera blimp for ease in operation.

Processing.—If the number of references in the technical press are a reliable guide, then it must be obvious from a perusal of them, that processing and its allied departments have

received as much if not more consideration than any other branches of the industry. Without any suggestion that less attention has been paid to the other sections of the art, it would seem that the laboratories would wish to refute the assertion made several years ago that they were lagging behind the photographic and electrical engineers. As early as 1933, considerable space was devoted in the B.J. to a communication (No. 448) on the duplication of cine negatives by J. I. Crabtree and C. A. Schwingel—June 9, pp. 332-334, June 23, pp. 364-365, and June 30, pp. 380-381. Since then, both in the list of relevant patents, and also in a Kodak communication (No. 577) by H. Parker and J. I. Crabtree, B. J., 1936, Mar. 6, p. 144, processing has continued to receive the attention which it deserves. This most important branch of the art is also covered in the following references.

Although it is generally assumed that America leads in technique, it is interesting to note that a survey of the laboratories in this country appears in J.S.M.P.E., Feb. 1936, **26,** No. 2, pp. 204-215, by I. D. Wratten, of Kodak Ltd., London. He is also responsible for lectures given to the Kinematograph Group of the Royal Photographic Society, and to the British Kinematograph Society, reported in the Journal, Sept. 25, 1936, p. 619.

Arnold and Richter, of Munich, announce in Kinotechnik, **14,** July 20, 1936, pp. 226-7, a new small " Arri " continuous processing plant for both standard *and* sub-standard film. Speed control, from 1½ minutes to 15 minutes, enables negative and positive, mute and track, to be developed on the same machine. It is an entirely enclosed tube-type apparatus, which with a two-minute development time, has a film speed of 1,300 feet per hour. During the past year, Amer. Cine. from Dec. 1935, to May 1936, has a series of articles by Dr. Herbert Meyer, on the Problems of Controlling Correct Photographic Reproductions, while the J.S.M.P.E. also contained numerous references to processing. These deal with such matters as " Uniformity in Photographic Development " by Crabtree, **25,** 6, pp. 512-522; notes on the Measurement of Photographic Densities with the Barrier Type Photocell, by Hiatt and Tuttle, **26,** 2, pp. 195-203 (Kodak Communication 567); a Report of the Committee on Laboratory Practice, **26,** 4, pp. 345-405, and in the same issue, a Report on Laboratory Controls, pp. 441-461, the former of these two last Reports also having a very full bibliography, as is the case with most of the papers printed in this journal.

SOUND. The advances in sound technique, both in recording and reproduction, are closely linked in many cases with laboratory practice. One of the most interesting developments in recording is the use of Ultra-Violet Light, Amer. Cine. Aug., 1936, **17,** 8, pp. 329 and 335-6, reported by William Stull, and in J.S.M.P.E. of the same month, **27,** 2, pp. 168-178, by G. L. Dimmick. On the reproduction side more attention is being paid to the elimination of parasitic noises, and to an extension of the frequency range. Sub-Standard film has likewise claimed its share of interest, as special equipment is being developed to deal with it. A combined picture and sound bench for sub-standard film cutting, made by the "Union" Company of Berlin, is described in Kinotechnik, Mar. 5, 1936, **5,** p. 78. It will handle both D.I.N. and S.M.P.E. standards and also standard sound track. It is interesting to note that speed control, with a stroboscopic check, is provided, down to 4 pictures per second, at which speed a compensating optical system gives flickerless projection. Collapsible cores are provided on the film plates. Useful J.S.M.P.E. references are, **25,** 5, pp. 389-422, 449-460; **25,** 6, pp. 492-511 and pp. 523-540; **26,** 1, pp. 67-78, and 89-94; **26,** 2, pp. 111-127; **27,** 3, pp. 284-314.

REFERENCES.

The names of the cine journals which are mentioned in the text in an abbreviated form are given in full below.

Amer. Cine. American Cinematographer, Monthly, U.S.A. 6331, Hollywood Boulevard, Hollywood, California.

J.S.M.P.E. Journal of the Society of Motion Picture Engineers, Monthly, U.S.A. Hotel Pennsylvania, New York, N.Y.

Kinotechnik. Die Kinotechnik, Bi-monthly, Germany. Stallschreiberstrasse 33, Berlin, S.W. 19.



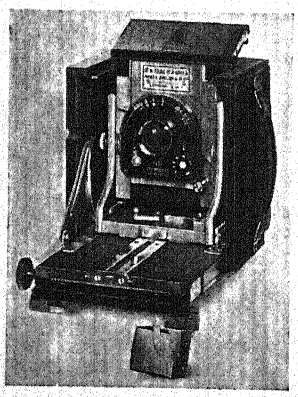
FOR STILL PHOTOGRAPHY.

(*Cine Requisites see page 289*).

THE SINCLAIR UNA CAMERA, WIDE-ANGLE PATTERN.

(Made by James A. Sinclair, Ltd., 3, Whitehall, London, S.W. 1.)

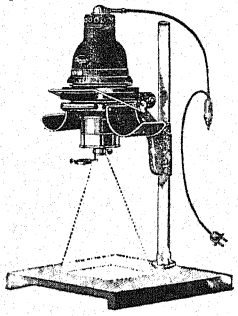
Taking into consideration the length of time which the Sinclair "Una" camera has been on the market, the care with which its design has been thought out and the excellent workmanship in its manufacture, it would hardly seem possible that it should have been found necessary to alter, let alone improve, it in any way. Such however is not the case, as is shown by the modifications made in its design to make it suitable for extreme wide-angle work. There are subjects, awkward ones admittedly, which demand a considerable rise of front in addition to the use of a lens of wide angle. Owing to the closeness of the lens panel to the back of the camera, the top of the body would obviously get in the way when the rising front is used, so to obviate this the body has a hinged top panel which can be swung out of the way as shown. This also prevents any cut-off of the extreme rays at the top. In the same way, on racking back the focussing slide and releasing a small catch on it, a section at the front of the baseboard can be hinged down out of the way, which the illustration also shows. In addition to the ordinary mode of use, this arrangement provides a valuable falling front when the camera is used upside down. Needless to say, these improvements do not entail any loss of rigidity, and the extra cost is £2 2s. 0d. more than the standard model.

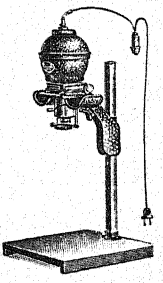


LIESEGANG ENLARGING APPARATUS.

(Made by Ed. Liesegang, Volmerswertherstrasse 21, Düsseldorf, Germany.)

A wide range of models of the Rajah enlarging apparatus is made by this firm, suitable for various sizes of negatives, from Leica-size and 3 × 4 cm. up to 9 × 12 cm. (approx. ¼-pl.). The model Rajah O is for miniature negatives, which gives magnifications of from 2 to 8 diameters. It is normally supplied without lens, and is designed for use with the standard Leica or Contax lenses; a lens can be supplied, however, if required. It is very quick and convenient to use, since the head may be moved up and down the column using one hand only, the clamp being released by means of a push-button, which immediately holds the head fast again on leaving go. Also, the square column with which the apparatus is fitted ensures that the projected picture is always square with the baseboard. When still larger pictures are required, the head is taken off the column and replaced in the reverse direction so that the image may be projected on to some lower support. Brilliant and even illumination is ensured by the use of an opal bulb in conjunction with a condenser. Other models of this series include Models IIb and IIIb, for 6 × 6 cm. and 6·5 × 9 cm. negatives respectively; whilst for professional requirements the Models IIIa and IV are to be recommended.





HALFTONE BLOCKS

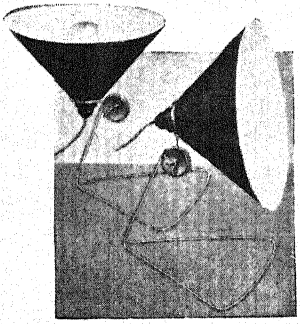
(Made by Garratt & Atkinson, Photo Engravers, Warwick Works, Ealing, London, W.5.)

For purposes of catalogue illustration, the clear detail of a halftone block is still preferred by many people. To this must be added the further advantage of the speed with which such blocks may be produced when the necessity arises and the fact that they may be printed from in conjunction with ordinary type, Messrs. Garratt & Atkinson were founded in 1894 and have a complete knowledge of all requirements for both the design of illustrations and the production of blocks from all kinds of originals. As a result of this experience, the firm may be relied upon for the production of uniformly excellent blocks both promptly and carefully. They also specialise in the production of three-colour blocks and are able to make excellent reproductions by either three- or four-colour printing from three-colour Carbro prints or Dufaycolor originals. Their further activities include also an artist department and commercial photographic studio.

ENSIGN MULTIFLOOD OUTFITS.

(Made by Ensign, Ltd., 88-89, High Holborn, London, W.C. 1.)

In conjunction with one of the photo-flood lamps now so much used both by amateurs and professionals alike, these lighting units should prove extremely useful in the home for either still or cinematography. The conical reflector is of strong card, lined white, and supported on a bayonet socket which, in turn, is fastened to a wire frame to act as a stand. A clamp enables the reflector to be adjusted and fixed in any position whilst the triangular foot of the stand makes it possible to hang the reflector from a hook or else stand upright. In this way, the light may be directed anywhere. The Multiflood outfit includes the reflector fitted with bakelite lampholder, 6 ft. of flex and plug and on a universal head stand, price 6s.



THE RUTHURSTAT COPYIST.

(Sold by Ruthurstat, 12/13, Astor House, Aldwych, London, W.C. 2.)

Photographic copying is steadily superseding the laborious task of typing and checking, many hours of which are necessary if the matter to be copied is of any substantial length. Nor does even the most careful checking eliminate entirely the possibility of human error. For most offices it is commonly believed that photographic copying necessitates an expensive camera, troublesome solutions, a darkroom and a skilled operator. The Ruthurstat requires none of these. It consists essentially of an illuminating box containing tubular lamps over which is stretched a diffusing screen of the same nature as opal glass but made of cellulose acetate safety film. This diffusing screen is held taut and is made so as not to come absolutely close to the sides of the box, which is enamelled white inside, but leaves a space down each side and at one end. This serves the double purpose of aiding ventilation and, more important, it gives better illumination of the margins and so enables larger originals to be copied. On the top of the box is a sheet of plate glass which serves to support the document to be copied, whilst in the lid is a rubber pressure pad which, when the lid is closed, presses the original into intimate contact with the sensitive paper and enables



the finest details to be sharply rendered. The sensitive material is a special paper coated with a very slow but highly orthochromatic emulsion. As a result, the copying process does not need a dark-room but can all be carried out in subdued daylight, as for instance in a part of an ordinary office away from a window. The method of copying is well known under the name of Playertype and of course no claims are made for the novelty of this part of the process. The Ruthurstat paper has the advantage, in addition to those already mentioned of being extremely thin, tough, and is coated on a very even base which allows good positives to be obtained by the normal contact printing process. The process of making a copy of a document is very simple; a piece of the sensitive paper is torn off from the roll, if the original is single sided and of average transparency it is placed on the glass plate with the printed side downwards, facing the light, and on top of it is laid the Ruthurstat paper, emulsion side down facing the document. The lid is closed and tightly fastened by means of two strong catches which maintain the sensitive paper in close contact with the original during the exposure. Exposure is given by means of a built in timing switch which is set for any exposure between one and sixty seconds. After exposure the paper is developed and fixed in the usual way for gaslight papers. A special developer is supplied which makes half a gallon of stock solution which is diluted to twice the quantity with water for use. When documents are of weak contrast it is possible to interpose a special yellow filter between the light and the original which improves the contrast of the original. There are two of these filters which work on the roller-blind principle and are made of non-flam cellulose material but are transparent. They can be used to cover the whole or part of a document and may be used either together or separately. The sensitive paper is kept in a spool box which has a light trapped lid with a knife which enables any length to be easily cut off. It is available in rolls of 60 ft. × 8 ins. and 60 ft. × 13 ins. and the loading box holds a roll of each size, side by side. The prices of rolls of paper of these sizes are 10s. and 16s. 3d. respectively. The Ruthurstat outfit costs £48 15s. 0d. and is supplied with a double spool box and is complete with built-in exposure timer, lamps, filters and electric flex. Its copying capacity is 16 × 13 ins. but larger sizes can be made to order. All other accessories can be obtained, such as enamelled dishes, drying oven, developing and fixing powder and all replacements.

THE GNOME MASKING FRAME

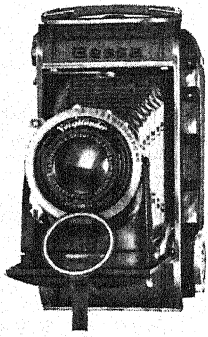
(Sold by Norse Trading Co., Ltd., 37, Rathbone Street, London, W. 1.)

When a white border is required on an enlargement it can be best secured by the use of a masking frame such as this. The paper is held flat by two adjustable metal bands, and by this means a white border up to ¼ inch can be obtained. The base is finished in white enamel, and serves for focussing and placing the image. The whole frame is of metal construction with the parts on which light is to fall finished in black; the scales for setting the bands are marked in inches. This frame is made in two sizes, for prints up to 10 × 8 ins. at 22s. 6d., up to 12 × 10 ins. 27s. 6d.

THE VOIGTLÄNDER RANGEFINDER BESSA CAMERA

(Sold by Schering Ltd., 188-192, High Holborn, London, W.C.1.)

The Rangefinder Bessa might, perhaps, best be described as the logical outcome of the Bessa camera reviewed in these pages last year. The improvements, however, do not stop at the mere addition of a rangefinder but include several refinements of importance. The focussing movement is controlled by a large milled wheel on the side of the camera seen at the bottom. This simultaneously operates the rangefinder, which seems to be a combination of the split image and coincidence type. In addition to indicating the distance focussed on, the depth of focus at any aperture is shown for any setting of the lens. As before, the camera takes half size as well as full $3\frac{1}{4} \times 2\frac{1}{4}$ pictures, and the viewfinder, which is of the optical direct vision type, and built into the rangefinder housing, gives the field of view for each size, the smaller picture being obtained by means of a swing-in supplementary lens controlled by a small knob on the top of the housing. As a further and very useful accessory, a yellow filter is permanently attached to the front of the lens by means of a hinge, and is to be seen in the illustration. By means of a special mounting these filters can be exchanged for either a light or medium yellow or a green filter. The shutter is the well-known Compur Rapid with the Bessa trigger release. Various Voigtländer lenses are available which makes the prices range from £16 10s. 0d. to £21 0s. 0d.



ZINCO COLLOTYPE PRINTING.

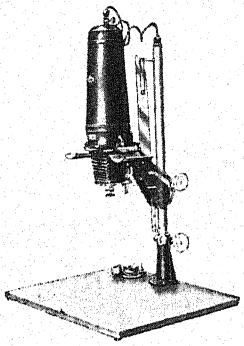
(By The Zinco Collotype Co., M'Donald Road, Edinburgh.)

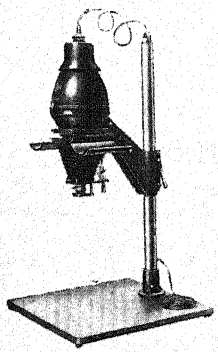
The outstanding feature of Collotype illustration is the elimination of the photo-mechanical screen. The negatives used in reproduction are continuous tone negatives and the prints are not broken up into a series of dots as in other photo-mechanical processes. The immediate result of this is the possibility of extremely fine definition in the resulting reproduction, on which, if it is a subject containing fine detail, it is possible to use quite a powerful magnifier and succeed in seeing still more detail in contrast to a similar treatment of a half tone reproduction. This property is of great value in such spheres as scientific and art illustration and it is in these that it is most used. The samples of work of this, and various other classes, which we examined were magnificent and fully supported all claims put forward for the process. Owing to the necessity for frequent machine stoppages during the printing process and the slowness of running of the machines in printing, the process is only competitive in short runs of a full sheet of illustration. The printing surface itself is comparatively cheap to prepare and, for runs of up to 1,500, given a full sheet of illustration it is possible to compete with process block printing or photogravure.

M. & W. FAM AND WEGA ENLARGERS.

(Sold by R. E. Schneider, 46, Farringdon Street, London, E.C. 4.)

An extremely wide range of these enlargers is now available for negatives of all types, from miniature up to post-card size, either with or without automatic focussing. They are made by Messrs. Müller and Witzig of Dresden. Two instruments, the Fam and Wega, are typical of the series. They are well and rigidly built, nicely finished and run smoothly. The Fam has automatic focussing which works by means of a cam fastened to the column on which bears a lever connected to the lens panel. The enlarging head can be moved up and down either by means of a friction wheel, or a rapid release lever enables this to be done very quickly. The standard lens, which is of $f/4{\cdot}5$ and $10{\cdot}5$ cm. focus, made by M. & W., is for negatives of sizes up to $3\frac{1}{4}$ ins. $\times$ $2\frac{1}{2}$ ins.; it enlarges from $1{\cdot}5$ to 7 times linear. For smaller negatives, this lens can be exchanged for either one of $7{\cdot}5$ or $5{\cdot}5$ cm. both $f/4{\cdot}5$, which enables the best quality to be obtained. These lenses must, however, be focussed by hand, for which provision is made. These two smaller lenses allow enlargements of 4 to 11 times and $5{\cdot}5$ to 15 times linear respectively The illuminating system is either fully diffused, by means of an opal bulb and opal glass screen, or else a double condenser may be used with either an opal lamp or a projection bulb. When using the condenser, a special extra tall and well ventilated lamphouse must be added. This has provision for raising and lowering as well as centering the lamp, so as to ensure even illumination.





A special film holder enables either film strips or separate film negatives to be used. By means of a cam and lever mechanism, the glass plates can be opened to allow the film to pass through and a spring ensures flatness. An adjustable guide with four stops ensures that the negatives of strips of different sizes will always be centrally placed in the gate. Beneath the film holder is a guide for the reception of masks for negatives of all the different sizes. These masks may be changed without altering the film guide in any way. There is, in addition, a special device for holding plates. This apparatus is meant to fulfil all amateur requirements which it does admirably. Its price, complete with lens, orange filter, strip film negative holder and a set of masks and illuminating head for

diffused light is £21. If it is required for condenser illumination, the price is increased to £25, which includes condenser and extra tall lamphouse.

For the professional worker and D. & P. workshops, there is the Wega enlarger which has not got automatic focussing, but takes negatives, either cut or strip film or plate negatives up to post-card size. The illuminating systems are exactly the same as for the Fam enlargers but the focussing is by hand. A friction wheel serves for the rough focussing of the lens, whilst a helical mount is used for fine focussing. The same rapid release and hand wheel arrangement is used for raising and lowering the illuminating head as is used on the Fam enlargers. The lenses are interchangeable also and in the same manner by means of a detachable panel which also carries the orange filter. The normal lens is of 13·5 cm. focus, *f*/4·5 whilst for smaller size negatives, lenses of 7·5 and 5·5 cm. focus may be used. The 13·5 cm. lens allows enlargements from 1 to 4 times and also small degrees of reduction, 7·5 cm. lens 2·5 to 10 times and the 5·5 cm. lens 4 to 13 times. By means of a special combined film holder and mask it is possible to use either cut films or plates; whilst a hinged glass plate arrangement allows uncut film strips to be used. The Wega for condenser illumination, complete with lamp, 13·5 cm. lens, orange filter and large lamphouse costs £25.

SASHALITE REFLECTOR UNIT.

(Made by Sashalite, Ltd., 28, Victoria Street, London, S.W. 1.)

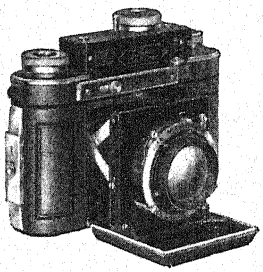
This latest type of Sashalite Reflector unit is identical in appearance with the previous model but incorporates various improvements in details of design. Of particular note amongst these improvements is the pilot light testing device. This is a small pilot bulb in a perforated metal guard, which when pressed enables a last minute test to be made of the state of the battery. This is quite independent of the pilot lamp which may be screwed into the socket in place of the flashbulb for testing purposes. The contact of this socket has been improved by making use of a spring centre pin which ensures good contact even when the bulb is only screwed in a turn or two. Also it is unnecessary to use a testing lamp of special design which has a long threaded neck, an ordinary type flashlamp bulb now suffices. Contact for firing the bulb is made by a trigger switch and so cannot be accidentally left on. For firing additional bulbs there is a pair of contacts, or for connection to a shutter synchronising device this means of making an additional connection can be used. When necessary the unit can be mounted on a stand since it has a tripod bush in the base. The unit, complete with battery (but not flashbulb) and with 11 inch reflector costs £1 10s. 0d., the same outfit with 16 inch reflector is priced at £1 15s. 0d.



THE CERTO DOLLINA II CAMERA.

(Sold by Actina, Ltd., 29, Red Lion Square, London, W.C. 1.)

The Dollina is a compact little camera for 35-mm. cine film, and possesses some very good features. In size it is about 5 × 3¾ × 1¾ ins. over all projections, and this with Compur-Rapid shutter and *f*/2 Schneider Xenon lens. The camera opens positively and rapidly, but without the rather vicious "snap" that characterises some "self-erecting" cameras. When open the front is absolutely rigid. And here we come to one of the special features: focussing is by a lazy-tongs motion of the struts supporting the lens-board, and is operated by a scaled milled head on the top of the camera, and as this focussing motion affects only the forward limit of the motion of the lens, the camera can be closed with the lens focussed to any point on the scale. For the same reason the focus can be set with the camera closed, when the camera will automatically spring to correct focus on opening. At the same time as setting the distance on which the camera is focussed, this knob on the top of the camera housing also operates the built-in rangefinder. This distance meter is of the split image type and gives very clear images. The price of the camera is low for its class and quality. Thus with the *f*/2 Xenon and 1/500th sec. Compur-Rapid shutter it is £19 19s. 0d., and this should prove the most popular model. Other models are fitted with *f*/2·9 Schneider Radionar and with *f*/2·8 Zeiss Tessar lenses, with Compur shutters speeded either to 1/300th sec. or 1/500th sec., at prices from £9 5s. 0d. to £18 18s. 0d.



STUDIO PILLAR STANDS.

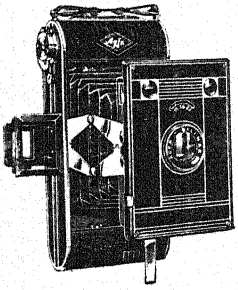
(Made by Louis Gandolfi & Sons, 2, Borland Road, Peckham Rye, London, S.E. 15.)

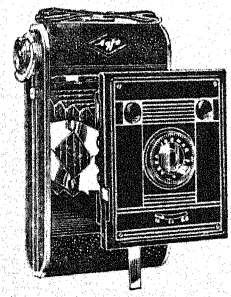
The stands which we had the pleasure of examining were very soundly constructed of polished mahogany. The sliding movements were very smooth in their action and the clamp fixed them in position without fear of slipping. The particular virtue of these stands is that they enable the camera to be used nearer the ground than on other models with just the same assurance of firm support as in any other position. All movements are available since the head is furnished with both a tilting and rotating top and a strong screw is supplied for fixing the camera. The standard model allows the camera to be about 2 ft. 3 ins. from the ground at its lowest point and when extended to its full height of 5 ft. 6 ins. it is extraordinarily rigid. The price of this standard model is £4 4s. 0d. The other one is of specially low construction and has a minimum height of only 1 ft. 6 ins. which is of obvious advantage. It extends to 4 ft. maximum height. Its price is the same as that of the standard model.

THE AGFA SPEEDEX CLACK CAMERAS.

(Sold by Agfa Photo, Ltd., 1-4, Lawrence Street, High Street, London, W.C. 2.)

Two new cameras of outstanding design have been added to the well-known Agfa Speedex series. These are the Speedex Clack, No. 74, for 8 $3\frac{1}{4} \times 2\frac{1}{4}$-in. pictures, and No. 51, for 16 pictures $1\frac{5}{8} \times 2\frac{1}{2}$-in. on a No. 20 spool respectively. In their general features the two cameras are similar. On releasing the catch, the front springs forward on a pair of hinged struts of a particularly rigid and efficient type, and locks very securely in position, whilst needing only straight pressure to close the camera again. The act of closing the camera causes a subsidiary shutter-blade to pass across behind the lens, thus preventing any possibility of accidental exposure while the camera is closed. In addition, the release is locked when the camera is closed, and with the camera open it can also be locked, by a touch on a lever, with the shutter either open—for time-exposures—or closed, as a safety catch. Provision is made for the use of a wire release. Both cameras are fitted with two brilliant finders, and the larger one also with a direct-vision collapsible finder (see top illustration). The shutter in each case gives instantaneous and bulb exposures—and time, as explained above—and three rotating stops are provided, *f*/8·8, *f*/11, and *f*/16 on the small camera with an Agfa Jgenar lens, and *f*/11, *f*/16, and *f*/22 on the $3\frac{1}{4} \times 2\frac{1}{4}$-in. camera, which has an Agfa Bilinar lens. A feature of the latter camera is an internal portrait lens which can be swung into position by an external lever; in the smaller model a ×2 yellow filter is provided instead of the portrait lens. Each is automatically removed by the closing of the camera. Loading is very convenient. Both spool cradles swing out for easy insertion and removal of the spools, whilst the red windows have spring back-covers to safeguard the film against prolonged exposure of the windows to a bright light. Altogether the two cameras are a worthy addition to the Agfa range. The price of the $3\frac{1}{4} \times 2\frac{1}{4}$-in. model is 36s., and of the $1\frac{5}{8} \times 2\frac{1}{2}$-in., 32s. 6d.





ZEISS FILTER POLARISERS AND ANALYSERS.

(Sold by Carl Zeiss (London), Ltd., Mortimer House, Mortimer Street, London, W. 1.)

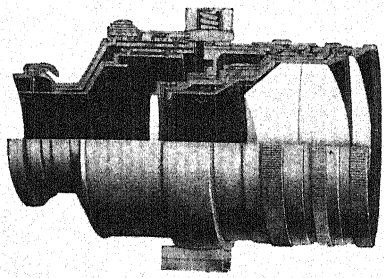
For the microscopist, work by polarised light has always had attractions but the question of expense has, in the past, been responsible for much work not being done. Filter polarisers and analysers are now available which enable an ordinary microscope

to be converted into a polarising model at a very reasonable cost. These filters have been developed by Messrs. Carl Zeiss in conjunction with Prof. Bernauer and are made in a variety of sizes and fitted in mounts for all purposes. There are various mounts to enable the analyser to be slipped on top of the eyepiece, both fixed and capable of rotation. The polariser is merely a filter of diameter 33 mm. which slips into the sub-stage. An advantage of polarising filters in microscopy is that the aperture of the condenser system is in no way reduced, as is the case with nicol prisms. Full prices and details are obtainable on application to Carl Zeiss (London), Ltd.

ZEISS TELE-SONNAR F/2.8.

(Sold by Zeiss Ikon Ltd., Mortimer House, Mortimer Street, London, W.1.)

This is a new lens of extra long focus combined with wide aperture which has been introduced this year for use on the Zeiss Ikon Contax camera for certain special purposes. The production of this lens was first prompted to meet the demands of photographers at the Olympic Games in Berlin and elsewhere, in order to get an image of reasonable size on the negative, a lens of extremely long focus was needed. The focus of the Tele-Sonnar is $7\frac{1}{8}$ ins., which, when compared with the standard 2-in. lens, will be seen to give an image over three and a half times the size at the same distance. A high aperture is essential if the very short exposures are to be given which are necessary for high speed action work, and for these requirements the aperture of $f/2{\cdot}8$ is ample. It should here be mentioned that the difficulties at one time encountered in manufacturing lenses of long focal length and wide aperture have been completely surmounted in this lens. The lens fixes to the Contax by means of the usual bayonet fitting, and automatically couples with the rangefinder. Its mount carries a tripod socket, which is so made as to allow the whole camera and lens barrel to be moved through 90° for upright pictures.



ENSIGN "SUPER-GLOSS" DRYER MODEL 30.

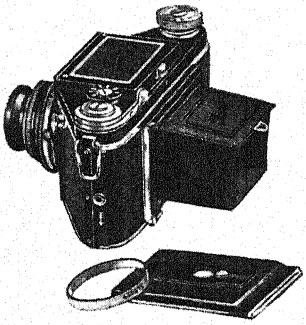
(Made by Ensign Ltd., 88-89, High Holborn, London, W.C. 1.)

The well-known Super-Gloss series of print dryers for D. & P. works has this year been extended by the addition of the Model 30. This is a de luxe machine, capable of a large output, and is designed as either a combined drier and glazer for glossy prints, or it may be made to dry matt prints. The heating system is either by gas or electricity, whilst the motive power is electric; in either case the consumption is small as is also the cost of maintenance. The price is £70.

THE MULTI-SPEED EXAKTA WITH PLATE BACK.

(Sold by Garner & Jones, Ltd., 29-30, Polebrook House, Golden Square, London, W. 1.)

The multi-speed Exakta reflex camera, which takes 4½ × 6 cm. pictures on standard size V.P. film, was reviewed in these pages last year; but in the meanwhile a further improvement has taken place in its construction which allows single dark-slides to be used with it by means of a detachable back panel. This latest modification is described as the plate-back Exakta. When roll films are being used, the back panel, which contains the film observation window, is left in place but is removed when small 4½ × 6 cm. (V.P.) plates are required. In its place may be slid a finely ground, hooded focussing screen. As the level of the focussing screen is different from that of the plane of the films used, the reflex screen cannot be used, since it is not in register. In order to make the scale of distances read correctly on the lens mount, there is a small spacing collar on the lens which prevents its focussing movement travelling too far back when films are used; its thickness is the difference between the two registers, and so for plates it is removed. The small dark slides are very neat and slide easily into and out of place in the back of the camera. The plate-back Exakta, with *f*/3·5 Zeiss Tessar, and three slides costs £26 10s. 0d.; extra slides, 2s. 3d. each.



THE NOVIFLEX REFLEX CAMERA.

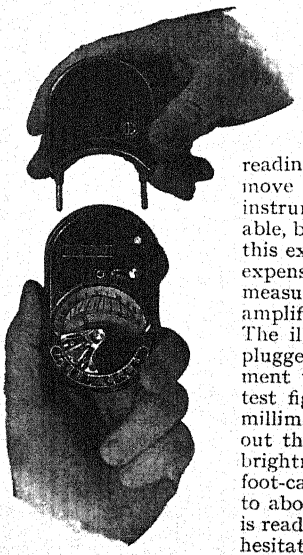
(Sold by Luminos, Ltd., 22, Bartlett's Buildings, Holborn Circus, London, E.C. 4.)

The Noviflex, which was reviewed last year, has in the meantime undergone one or two changes and improvements in certain directions. It is a mirror reflex camera for roll film taking twelve pictures 2¼ ins. square on a standard 3¼ × 2¼ ins. spool film. A variety of lenses of quite high aperture, namely *f*/3·5 or *f*/2·9 of Ludwig, Meyer or Schneider manufacture, are available and by means of a screw mount, these are interchangeable against a Meyer Tele Megor of 150 mm. focus and aperture *f*/5·5. Besides the interchangeable lens mount, another of the improvements is a cover to the film observation window which now makes it quite safe for the use of panchromatic materials of all kinds. Lastly, there is now a direct vision viewfinder of the sports, frame type in addition to the reflex focussing screen. The back sight of this folds down on to the top of the camera which normally covers the focussing screen, whilst the frame folds over the lens panel. In spite of all these very useful and practical improvements and refinements, the prices remain the same as formerly, namely from £10 10s. 0d. with Ludwig Victar *f*/3·5, up to £16 10s. 0d. with Schneider Xenar *f*/2·9.

THE TEMPIPHOT PHOTO-ELECTRIC EXPOSURE METER.

(Sold by R. F. Hunter, Ltd., 51, Gray's Inn Road, London, W.C. 1.)

Most of our readers will be familiar with the forerunner of this meter—the Tempophot. The new meter differs very little in name, but represents a great advance in performance. In sensitivity, convenience, and reliability the Tempophot always excelled, and the new meter is just as reliable, more convenient, and, thanks to a detachable amplifier, more sensitive: it is, in fact, now by far the most sensitive meter we have tested, and will give a reading on indoor subjects that would not move the needle of other photo-electric instruments. The amplifier being detachable, being merely plugged in when required, this extra sensitivity is not obtained at the expense of size, for the Tempiphot alone measures only $3\frac{1}{2} \times 2\frac{1}{4} \times \frac{3}{4}$ in., whilst the amplifier will slip into a waistcoat pocket. The illustration shows the amplifier being plugged in. The sensitivity of the instrument will be apparent from the following test figures. A full division—about one millimetre—deflection was obtained, without the amplifier, with an average subject brightness of about 1-ft. lambert ("reflected foot-candle"); the amplifier reduces this to about one quarter. Half this deflection is readily estimated, and we should have no hesitation ourselves, if need be, in being guided by the least estimable deflection—about one-fifth of a division—provided the zero of the exceedingly sensitive movement has been accurately set with the adjustment provided. This minimum reading, amounting to something like 1/20th-ft. lambert, corresponds to an exposure, even with the fastest material available, of something like a minute at *f*/8. The makers claim a sensitivity of two minutes' exposure at *f*/9 with a film of 23 deg. Scheiner. This, amounting to about half our estimated limiting sensitivity, would appear to correspond modestly to estimating the first half division, which is safe with the most ordinary care.



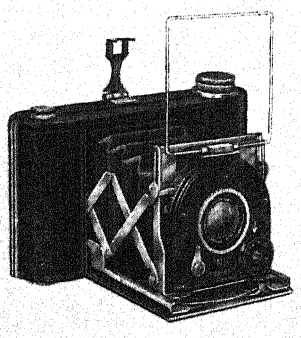
For the benefit of those already familiar with the older Tempophot, one important improvement should be noted. Formerly the instrument was in effect provided with a double scale, and care had to be taken in reading that the correct value was read off, according to the position of the "throttle" lever. This is now overcome by providing three pointers on the diaphragm-setting lever, one for each of the two positions of the throttle lever, and the third when

the amplifier-cell is in use. There is accordingly one scale only, and the possibility of any mistake is, with reasonable care, remote A further valuable feature is the provision, above the exposure scale, of a scale of cine speeds of 8, 16, 32, and 64 frames per second. This enables the meter to be held in one hand, and the correct aperture read off with only the movement of the thumb necessary to bring the speed number over the pointer channel. The Tempiphot. is, in short, one of the simplest and safest meters, both for still and cine. The price of the meter alone, without amplifier, is £3 15s. 0d. The amplifier costs £1 17s. 6d., and a neat little zip-fastening morocco case is made for each at a price of 5s.

THE NEW "R.M." MINIATURE CAMERA.

(Sold by London Camera Exchange Co., Ltd., 20, Bucklersbury, Queen Victoria Street London, E.C. 4.)

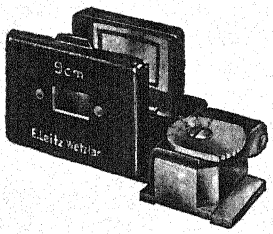
The new "R.M." miniature is essentially and entirely an all-British product, and it is specially designed to provide the skilled amateur or professional photographer with an instrument for serious work which is, at the same time, really pocketable and not uncomfortably heavy when it is pocketed. Its dimensions when closed are $5\frac{1}{4} \times 2\frac{1}{2} \times 1\frac{1}{4}$ ins., and its weight is just 16 ozs. A great point in its favour, when comparisons of size and weight are made, is the large size of picture which it takes in relation to its actual size. The film used is the standard $3\frac{1}{4} \times 2\frac{1}{4}$ roll film, on which twelve pictures $2\frac{1}{4}$ ins. square are made with the possible alternative of using a special mask and taking sixteen $4\frac{1}{2} \times 6$ cm. (V.P.) size negatives on the same size spool. Thus, for the size of camera, the picture is a very big one. For the sake of simplicity and easy working, all dispensable gadgets have been eliminated, leaving nothing but the necessities for efficient working in the hands of a skilled photographer. The advantages of a square "format" are now sufficiently well known and recognised as to require no further description, but for those who consider it necessary this camera provides what no other square picture instrument of its type offers, namely, a rising front. A full half inch of rise is obtainable, which is very substantial when considered in relation to the size of the picture. The viewfinder is of the folding frame, direct-vision type, and so serves to show the picture whether the rising front is in operation or not. The backsight of this finder, it will be noticed, folds down and serves as a clip to keep the camera front closed when not in use. For optical equipment, a choice of well-known lenses of British manufacture is available having various apertures, either *f*/3·5, *f*/4·5 or *f*/6·3. The shutter is the well-known N.S. "Perfect." Focussing is by a radial lever giving settings from 3 ft. to infinity.



LEITZ ACCESSORIES FOR THE LEICA CAMERA.

(Sold by E. Leitz (London), 20, Mortimer Street, London, W. 1.)

The continued development of this wonderful little instrument year by year results in a regular crop of accessories designed to make it fulfil some further specific purpose. Not content with the rapidity with which the camera can be normally worked, Messrs. Leitz have introduced a rapid winding device which replaces the ordinary lid of the camera and which carries a sliding trigger operated with the left forefinger. By alternately drawing along the trigger and releasing the shutter, exposures can be made as fast as three a second. According to the finish of the rapid winder so the price is either £3 7s. 6d. (black) or £3 14s. 6d. (chromium). For photographing small objects relatively close to the camera, it is now possible to focus the 5 cm. lens automatically by means of the built-in rangefinder for distances from 3½ ft. down to about 17 ins. by using the optical near focussing device. The lens is fastened into it by means of its bayonet catch, and the whole device is then screwed into the camera, whereupon it couples with the rangefinder and at the same time automatically corrects the parallax of the viewfinder. For use with 5 cm. Elmar or Summar lenses, price £5 12s. 6d. (nickel), £5 14s. 6d. (chromium). For lenses of greater than 5 cm. focus there is now a small folding optical sports finder in three models of the type which shows the actual field as a heavy white line superimposed on the view as seen. Its special optical construction enables it to give a bright image of the frame even in poor light, together with the added advantage that both the frame and the picture can be seen simultaneously without eyestrain. There is also parallax correction for distances of less than 15 ft. Price £2 0s. 0d. (black) or £2 7s. 0d. (chromium). A viewfinder of similar optical construction but of greatly increased field is also available for use in conjunction with the recently introduced extra-wide angle lens (£3 12s. 0d.).



STUDIO BACKGROUNDS.

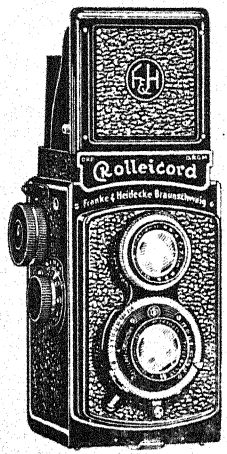
(Made by Pemberton Bros., Background Studio, 2, Thorn Grove, Morton, Blackpool.)

In a portrait studio where accommodation is limited some suitable background is an essential. This is particularly the case in certain types of professional business and it is usually necessary to have available a variety of different settings into which the sitter can be placed. Messrs. Pemberton Bros. manufacture a very wide variety of suitable backgrounds and will send their list illustrating the various designs on application. The prices are according to size and range from 12s. 6d. for one size 5 × 4 ft. up to £2 for a background 10 × 8 ft. This type is particularly suitable for portrait work where only a head or head and shoulders is required. More elaborate settings for full lengths and groups are, of course, bigger and possess a foreground ; the prices range upwards from £1 6s. 0d. These prices, as are all of them, are strictly nett.

THE ROLLEICORD MODEL II.

(Sold by R. F. Hunter, Ltd., 51, Gray's Inn Road, London, W.C. 1.)

The Rolleicord and Rolleiflex cameras, which are the product of Messrs. Franke & Heidecke of Brunswick, are sufficiently well known in general to require little further description here. Of considerable interest, however, is the latest model of the Rolleicord, described as the Model II, which embodies a number of refinements and improvements on its predecessor and even possesses one or two features which the Rolleiflex itself has not got. The outstanding new features are first of all an automatic film winding arrangement whereby on turning on the film it is automatically stopped when the correct amount has been turned on. This prevents partial overlapping of the exposures and saves time since the exposures are automatically counted. The hooding of the focussing screen has been much improved and can now be opened, and more especially closed in one single movement. By releasing the spring catch at the back of the hood it springs up and when closing, it is simply necessary to press the top down and the whole hood folds up. When the direct vision viewfinder is needed it is brought into operation by means of a small lever on the right of the front of the hood. A cover springs up and a mirror comes into place in such a position that by looking into the lens at the back of the hood, the focussing screen may be seen and the image focussed as well as using it as a sports finder. A depth of focus scale has been provided on the focussing knob which is on the right hand side. This enables the depth of focus to be read off direct for any stop without the necessity of consulting any tables; it is thus much more practical and likely to be used. There are other smaller points, such as a simple exposure table affixed to the back of the camera, also the body of the camera is leather covered. The lenses fitted are either a Zeiss Triotar $f/3{\cdot}5$ or $f/4{\cdot}5$ and both these models take all Rolleiflex accessories with the exception of the angle mirror. With Triotar $f/3{\cdot}5$ the Rolleicord II costs £16 10s. 0d., or fitted with $f/4{\cdot}5$ Triotar its price is £14 10s. 0d. Ever Ready case for either model is £1.



ZEISS HEROTAR POLARISING FILTER.

(Sold by Carl Zeiss (London), Ltd., Mortimer House, Mortimer Street, London, W. 1.)

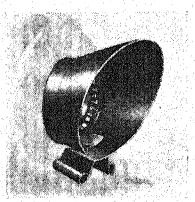
Unwanted reflections from polished surfaces of any description have long caused trouble in photography. It has been known for a great length of time that these reflections, when from a non-metallic surface, were to a greater or less degree, plane polarized. It was not until the advent of a polarising filter which could be

placed on the front of the lens, that this property could be made use of. The Zeiss Herotar looks like a yellow green filter but has on its mount a pair of marks opposite one another showing the plane of polarisation of the filter. Up to the present, four sizes are available ranging from 28·5 mm. diameter at £2 15s. 0d. to 51 mm. costing £5 13s. 0d. On account of their colour and the loss of light as a result of polarisation, an increase of 2 to 3 times in exposure is necessary.

THE A.R.C. METAL LENS HOOD.

(Sold by The Altrincham Rubber Co., 2 and 4, Kingsway, Altrincham, Cheshire.)

The photographer who requires a lens shade for any camera or lens should not fail to give due consideration to the A.R.C. Lens Hood since it possesses certain features which cannot fail to recommend it. This lens shade was formerly known as the C.E.W. Lens Shade and as the illustration shows is of conical shape but cut away obliquely. Normally the hood is used on a lens with the longest part of the projection uppermost if the light is coming from above, but when from the side or from below, as is sometimes the case when special subjects are attempted with their consequent special directions of lighting, the hood can be turned round in such a way as to shield the lens from the light in any manner desired.



Fitting is simplicity itself and it is merely clipped on to the lens mount which it gently grips. All scratching is avoided by lining the inside of the spring collar with velvet. The two lugs seen at the bottom suffice to open and close it enough to put it on and take it off the lens. The price of this excellent lens hood, complete in box, is 2s. for lenses up to 1½ ins. in diameter and 2s. 6d. for lens of greater than this size.

STORAGE ALBUMS FOR MINIATURE NEGATIVES.

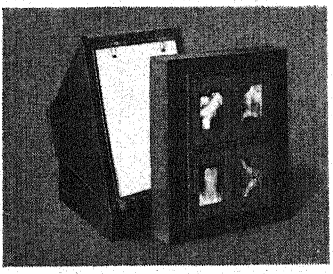
(Sold by E. Leitz (London), 20, Mortimer Street, London, W. 1.)

These albums are for storing Leica and similar miniature negatives cut up into strips of four. They are made in two patterns; a small album is made which takes 9 strips of four exposures. These film strips slide into pockets in a sheet of transparent paper which is folded up, concertina-wise into a cover which contains a printed index for exposure data. The large negative album takes 12 complete spools of 36 exposures, cut into strips of four. Each strip goes into an individually numbered pocket. The mouths of these transparent paper pockets are so designed that negatives can be removed and replaced with a minimum of handling. The index provided has ample space for notes and exposure data in addition to the film number. The whole album is strongly bound and measures 6¾ × 6 × ½ ins. The price of the small storage album for 36 exposures is 6d each, whilst the large one costs 4s. 6d.

ILFORD X-RAY VIEWING LANTERN.

(Made by Ilford, Ltd., Ilford, London.)

A new viewing lantern (Royal Cancer Hospital pattern) for X-ray films has been designed which has exceptional efficiency combined with a good ventilation system to dissipate the heat produced by the lamp. The illumination produced is very brilliant, and it is secured by the use of a 100-watt pearl lamp in conjunction with a mirror lining to the lantern which thus gives the maximum of light with the minimum of heat. Even illumination is ensured by the interposition of an opal blue glass diffusing screen between the lamp and the transparencies which may if required, be viewed wet, since a drip-tray is provided.



Owing to the brilliance and colour of the illumination provided, this viewing lantern is especially suitable for the viewing of Dufaycolor transparencies and lantern slides. For this purpose the loose frame illustrated is slipped on to the front of the lantern into which the transparencies may be quickly placed in position. The size of the opal viewing panel is 15 × 12 ins., and two types of detachable frames are available for either four Dufaycolor transparencies in mounts size $7\frac{1}{8} \times 5\frac{3}{8}$ ins., or alternatively, of size suitable for either 16 lantern slides or 12 quarter plates. The whole lantern, as well as the viewing frames are finished in Ilford cellulose of olive green colour. The price of the viewing lantern, complete with bulb, is £3 12s. 6d., whilst detachable frames of either pattern described are 15s. each.

AEROGRAPH AIR BRUSHES.

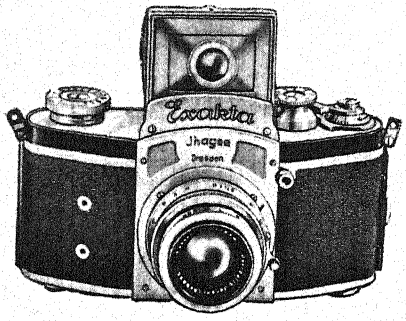
(Made by The Aerograph Co., Ltd., Lower Sydenham, London, S.E. 26.)

A wide variety of uses is now found for the air brush in photography, since by its aid a great deal of tedious work can be saved and at the same time better results obtained. It serves, so it seems, for the smallest as well as the largest of jobs. Retouching work on either negative or print can be carried out with its help, vignetting, filling in backgrounds, removing unnecessary detail, strengthening shadows or highlights are amongst the multiplicity of purposes to which it may be put. The colour is always under complete control and is applied without leaving brushmarks of any kind with the result that it blends perfectly with the tones of either negative or print. Its use in process retouching is so well known as not to need any further description except to say that a skilful worker can improve an unsuitable original beyond all recognition. The Aerograph Co. manufacture a number of different models of air brush and also hand, foot and electric pumps suitable for use with them. Full particulars and prices may be obtained on application.

THE KINE EXAKTA CAMERA.

(Sold by Garner & Jones, Ltd., 29-30, Polebrook House, Golden Square, London, W. 1.)

From advance information which we have received concerning this camera, it seems that it is to be, in outward appearance at least, very similar to the well-known Exakta camera taking V.P. size pictures. The Kine Exakta, however, as its name suggests, makes use of 35 mm. perforated standard cine film, and takes on this film up to 36 exposures of the usual 1 × 1½ ins. size. The usual combined film transport and shutter winding mechanism is embodied in this camera, and at the same time the exposures are counted; this system, it will be seen, obviates double exposures and saves time in changing from one exposure to the next. The lens of the Kine Exakta may be interchanged by means of a bayonet catch arrangement, and each lens is in its own helical focussing mount; as each and every lens is standard it can be used on the camera without any previous adjustment. By means of a locking device, exposures cannot be made before the focussing hood has been opened, and this discloses the focussing screen, which consists of a plano convex lens, the flat side of which is frosted; further, the picture on the screen is larger than that of the negative and is of size 32 × 43 mm. There is an auxiliary magnifier for critical focussing. The camera is, of course, daylight loading and takes either the usual film cartridges or special cassettes. The back is completely detachable. By means of a built-in cutting knife the exposed film may be cut off and then removed in a dark room.



LANTERN SLIDE MAKING OUTFIT.

(Made by Ensign, Ltd., 88-89, High Holborn, London, W.C. 1.)

This is a simple outfit which enables the amateur to contact-print his own lantern slides in a printing frame, mask them and bind them with cover glasses. All the necessities are provided except the actual lantern plates. Designed especially for the miniature camera user, sets are made which contain suitable printing masks for various sizes of miniature negative on the standard slide, for instance 1 × 1½ ins., 2½ ins. square, and half 3¼ × 2¼ size. According to the size of negative used, so is the size of the lantern slide mask selected. The glass cover plates are already provided with gummed binding strips which all goes to make the work easier. The set consists of a printing frame for standard size slides with a guide slot for strip films, a set of negative masks of appropriate size, 12 slide masks and a dozen combination binders and cover glasses. The set costs 5s. 6d.

BARNET REPROLINE FILM.

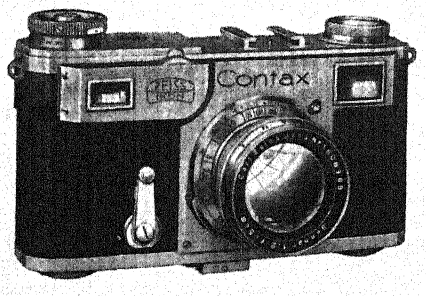
(Made by Elliott & Sons, Ltd., Barnet, Herts.)

Reproline is a new Barnet product and is intended particularly as a negative material for line work. In this respect it will be of interest to all process workers. It may be used for copying of type matter, of manuscripts and for similar purposes and it may be used with equal success for coarse-screen half-tone work. The base is of a specially developed type and is highly transparent, it lies flat, may readily be cut up and pieced together, thus greatly facilitating the printing down of composite work. Owing to the thinness of this base it can be printed from the film side without loss of definition. The emulsion is rich in silver and is thus capable of giving extremely high contrasts; its speed is approximately 15 H. & D. Reproline is supplied in rolls of any width up to 40 inches or in cut sheets. Full details and prices will be supplied on application.

THE CONTAX MODEL II.

(Sold by Zeiss-Ikon, Ltd., Mortimer House, Mortimer Street, London, W. 1.)

A new and much improved model of this camera is now available under the name of Contax II, which incorporates several features worthy of note. The shape and finish are the first things which strike the observer as having undergone change. The ends have been bevelled off so as to present a rounded appearance which is both better in looks as well as more comfortable to hold in the hands when in use.



The finish, which was formerly of black enamel, is now partly dull and partly bright chromium plating; the top and bottom plates, lens-panel and mount, as well as the various fittings, such as winding and rewinding-knobs, and finder-frames, are plated in this manner. More important than finish, however, are radical constructional improvements which make for greater ease in manipulation. In the first place, the combined shutter-winding and film transport-knob has been transferred to the top of the camera, so that by virtue of its ready accessibility exposures in fairly rapid succession are easier than formerly. The release-button is now in the middle of this winding-knob, and the exposure counting-dial has been built in.

The highest shutter-speed has been increased to 1/1,250th sec., and the whole range of shutter-settings down to $\frac{1}{2}$ sec. is now visible at once. Speeds may be set, as previously, either before or after winding. A built-in delayed-action mechanism facilitates self-portraiture and enables the operator to appear in a group, whilst by

suitable manipulation this mechanism can be used to extend the range of automatic exposures to 1 sec.

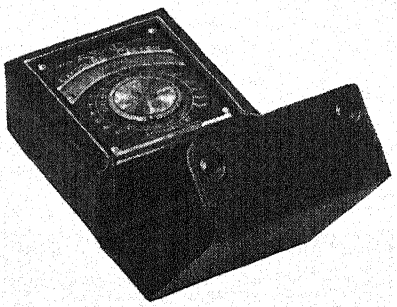
The other outstanding improvement is the combination of the viewfinder and distance meter in such a way that the one eyepiece serves for both, so that the entire field of view can be seen simultaneously with the rangefinder image. The mount of the Sonnar 5 cm., *f*/2, lens has been so redesigned that it is now collapsible into the body of the camera, making it of much smaller bulk.

As might be expected, these improvements necessitate making the Contax II somewhat more expensive than its predecessor, so that the prices now range from £40 10s. 0d. to £65 15s. 0d., according to the optical equipment provided.

THE NEW "AVO" EXPOSURE METER.

(Made by The Automatic Coil Winder and Electrical Equipment Co., Winder House, Douglas Street, London, S.W. 1.)

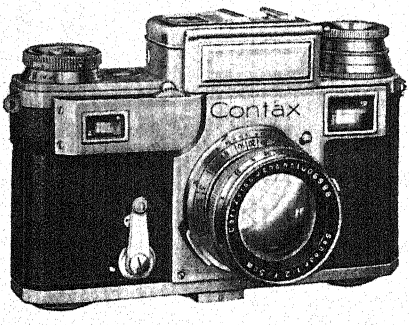
Although somewhat similar in shape, the new Avo meter differs fundamentally from the old one in certain details of construction and manipulation. As a result of the new calculator system adopted the variable resistance and the pointer scale have been dispensed with, and in its place has been substituted a movable index-mark which is controlled by the calculator dial, and which is set against the moving pointer of the meter. The procedure, therefore, is simply to set this index-mark by rotating the calculator-dial to the position which the pointer takes upon pointing at the desired part of the subject, whereupon the calculator shows the full range of stops with the appropriate shutter-speeds against them. The emulsion speed dial of the calculator must first be set to the speed-number of the plate or film in use. The calculator shows stops from *f*/1 to *f*/32, and exposures from 1 minute to 1/1,000th sec., whilst the sensitive materials catered for range from 200 to 5,000 H. and D. For cine workers there is a special mark at 1/32nd sec., equivalent to 16 frames per second, and against this the correct stop can be read off. The instruction booklet contains a very complete and up-to-date list of films, plates, and cine-films with their speeds classified in so-called "Avo-H. and D." speeds. The picture-angle of the cell is about 60 degs., which has been achieved by dividing the cell into three compartments by means of two partitions. A considerable reduction in size has been effected, the measurements now being approximately 1 × 2½ × 2⅝ ins. over all, without its case. The price of the meter is £2 17s. 6d., and the black morocco ever-ready case is 5s. extra.



THE CONTAX MODEL III.

(Sold by Zeiss-Ikon, Ltd., Mortimer House, Mortimer Street, London, W. 1.)

As a fitting completion to the Contax series of miniature cameras the Contax Model III has now been produced. These pages already carry a review of the Contax II, and this new model is in all ways similar to its forerunner, with the single exception that, in addition, it has built into it a photo-electric exposure meter, which can clearly be seen on the top of the camera housing in the illustration. The built-in exposure meter of the Contax III is connected with the large knob seen on the right of the camera and by means of this it is possible to adjust the needle of the meter to the index mark, or to one of the factors 2, 5, 10, or 20, which must be used if the light is not sufficiently strong to give a reading on the main mark. The rest of the knob is in the form of a calculator which enables the exposure to be read off for any stop and film speed. The cell itself is protected in front, when not in use, by a hinged flap which springs up at a touch, revealing a series of glass vanes so devised as to restrict the angle of field of the cell to that of the 5 cm. camera lens. The flap then acts as a sky shade. The topmost part of the calculator knob is the rewinder whicih it is necessary to use with cassettes or film in daylight-loading cartrdges. We understand that it will in the near future be possible to convert the Contax II into the model III, but for this purpose it will be necessary to return the camera to the Zeiss-Ikon works. The prices of the Contax III range, according to the optical equipment, from £53 to £78 5s. 0d.



JOHNSON'S "CONSTANT ENDURA" DEVELOPER FOR D. AND P.

(Made by Johnson & Sons, Ltd., Hendon, London, N.W. 4.)

"Constant Endura" is a new developer having all the properties of "Endura" developer, well known to D. and P. workers on account of its remarkable keeping qualities, with an added feature which converts it into an automatic developer of constant activity throughout an extremely long life. At constant temperature, and with constant time of development, it will develop over 300 spools per gallon to a uniform degree of density and contrast, thus enormously simplifying and standardising printing conditions. The new feature lies in the use of the strengthener which, when added in just sufficient quantity to restore the level of the tank, as it is gradually lowered by the removal of the developer by the wet films, not only restore

the activity of the used developer, but compensates for the additional bromide introduced by the action of the developer on the exposed films. A 10 gall. tank, say, of developer is made up, and spools are developed in it at a constant temperature for a constant time, the level of the liquid being kept up by periodic addition of portions of the 10 gall. of solution of the strengthener supplied with the developer. By the time some 3,200 $3\frac{1}{4} \times 2\frac{1}{2}$ ins. spools have been developed it will be found that the whole of the strengthener will have been used up to replace the developer extracted by the spools. Actual tests were conducted on three types of materials, namely Selochrome roll-film, Auto-filter, and Golden Iso plates; in each case the material was divided into two parts one of which was developed in fresh "Constant Endura," whilst the other was developed after 300 spools per gallon had been passed through it. The results showed no perceptible difference in either density or contrast. A complete classification of all well-known films under three groups, and a time and temperature slide-rule calculator for temperatures from 62° to 70°, are supplied by the makers, so that all that has to be done is to set the calculator to the temperature of the tank and develop accordingly till the strengthener is exhausted. The developer is put up in six sizes, for tanks from 5 gall. to 40 gall. capacity, at prices from 13s. to 96s.

BARNET ULTRA-SENSITIVE PANCHROMATIC PLATES AND SUPER-PANCHROMATIC PRESS PLATES.

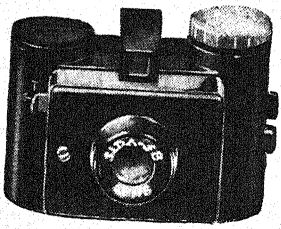
(Made by Elliott & Sons, Ltd., Barnet, Herts.)

These two varieties of plates, both rated at 2,500 H. and D. to daylight, 8,000 H. and D. to half-watt light, have been produced to meet the requirements of commercial studios and of Press photographers respectively who have to tackle subjects (and who, nowadays, has not?) which are either poorly illuminated, or which, being moderately illuminated, call for short exposures. The panchromatic qualities, of course, are for the dual purposes of proper rendering of warm colours and of permitting brief exposures under artificial light. With all these ideas in mind, exacting tests were given to the plates on subjects and under conditions which would call to an extreme degree for that combination of qualities. The varied subjects included almost inaccessible machinery (inaccessible as regards lighting as well as physically), and others which included flowers of a variety well calculated to demonstrate panchromatic qualities. In both varieties of subjects were some in which extreme shadow detail, by reason of the brief exposures which only could be given, might reasonably be expected to be absent in the negatives. The subjects happened to include in each case an amount of strongly lit matter of pale character, which would inevitably have "flattened out" by reason of its comparatively great over-exposure as compared with the abrupt shadows. The results in every case were a tribute to the obvious combination of extreme speed and latitude. These facts, together with the very satisfactory colour-rendering bear witness to the excellence of these plates in actual practice for the exigencies they are put forward to contend with.

THE SIDA CAMERA.

(Sold by British Sida Cameras, Ltd., 43, Bartholomew Close, London, E.C. 1.)

Judging by the clear enlargements which may be obtained from suitable negatives taken with this little camera, it can truthfully be said that it is a very efficient instrument for the money. It is made in bakelite in two parts, the front of which contains the lens, shutter, viewfinder and film winding device, whilst the back is simply a detachable cover with the usual red window. There are a number of features not usually to be found on a camera of this type. The viewfinder is of the optical direct-vision type and is mounted, as can be seen, on top of the camera. The shutter gives a snapshot exposure and in addition, by pulling out a small lever seen on the left, it enables time exposures of any length to be given. The lens is of the meniscus type and has an aperture of *f*/8 which is wider than that of most similar cameras. It has a tripod bush but this does not seem to be of any standard gauge and so rather fails in its purpose unless a special adapter is available. As the bottom of the camera is flat it can be rested on some level surface instead of a stand for making time exposures. The picture is a square one of size exactly one inch and the film is of special size which gives 10 exposures; it is a fine grain, fast, orthochromatic emulsion. The price of the special Sida film is 1s. per spool whilst the Sida camera sells at 5s. and is furnished with complete instructions for working.



AGFA ATOMAL FINE GRAIN DEVELOPER.

(Sold by Agfa Photo, Ltd., 1-4, Lawrence Street, High Street, London, W.C. 2.)

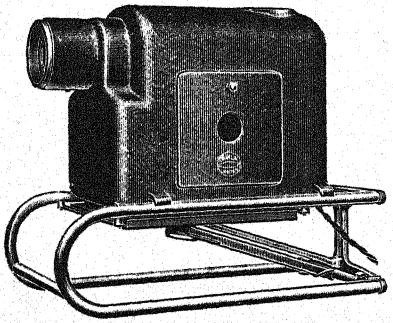
Atomal is a new developing agent designed to give the extremely fine-grain results associated with paraphenylene-diamine without its attendant disadvantages of staining, risk of poisoning, and the need for a considerably longer exposure of the film than is necessary for other types of developers. Atomal does not contain paraphenylene-diamine; it does not stain dishes or hands, develops quickly, and does not necessitate greatly increased exposures. In practice only a very slight increase of exposure is needed over that required with ordinary fine-grain developers, whilst the resulting grain is very much finer, 12× to 15× enlargements being easily possible from negatives on Isopan roll-film developed with Atomal. Soft negatives, of sufficient density and good gradation, are obtained with quite short development—the times recommended are from 6 mins. for the extra-fine grain FF Isopan miniature film to 8 to 10 mins. for the majority of Agfa stock. Development should not be prolonged, as this tends, as usual, to coarsen the grain. Certain precautions stressed in the makers' instructions are no more than should be observed with any other developer. Thus, although the developer may be used several times, it is necessary to keep it

meantime in a well-stoppered bottle, and it should not be allowed to remain for too long in an open dish. With these obvious precautions the developer is stated to keep well. It is put up in a very cleverly designed packing which consists essentially of a tin container with a lid both top and bottom, and an internal partition which separates the developing agent from the alkali. This is obviously better than the former glass tube since it is not liable to break. The directions are held in place in the hollow of the lower lid by means of a flexible metal clip and are thus in a place where they cannot be overlooked. For use, the two are dissolved separately, and the developer solution added to the alkali. The 2s. carton makes 300 c.c. (10½ ozs.) of working solution.

BAKER SCHOOL EPISCOPE

(Made by Chas. Baker, 244, High Holborn, London, W.C. 1.)

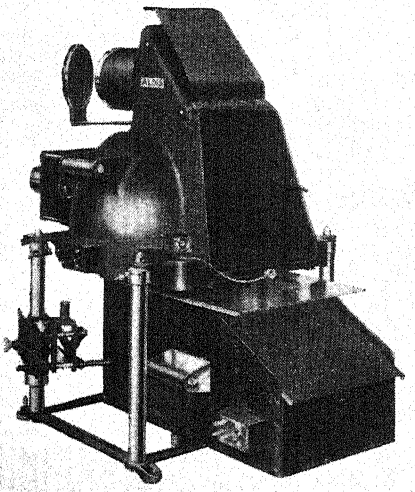
For all sorts of teaching purposes as well as industrial and various kinds of instructional work, the use of episcopic projection is becoming more and more generally used. Where it is not possible to purchase one of the more advanced instruments of higher power on grounds of expense, the new Baker School Episcope should amply fulfil the more modest requirements of ordinary classroom use. In this instrument which has been specially designed to meet the need of those institutions which cannot afford to purchase a more elaborate model (and they are, unfortunately, only too numerous) simplicity of design coupled with efficiency of working has been constantly kept in view. On grounds of expense, fan cooling cannot be incorporated but an efficient system of convection currents is utilised which serves to keep specimens cool for reasonable lengths of projection time. The lens is an anastigmat of *f*/3·5 and focal length 16 ins. which gives brilliant pictures of excellent definition at distances of from 15 to 20 ft. The light source is a silver-backed, 500 watt projection bulb which is supplied for any voltage between 100 and 250 volts. The picture opening in the base is 6 ins. square but by virtue of the sliding housing, it is possible to show objects much larger than this in sections. The stage is large and roomy and in addition there is ample space beneath it when it is necessary to project from the pages of large books. The body of the episcope is of very sturdy design and is cast solid in one piece whilst the undercarriage is constructed of chromium plated, welded steel rods. The price of the School Episcope, complete is £18 18s. 0d.



SUB-ILLUMINATOR FOR ALDIS EPIDIASCOPE.

(Made by Aldis Brothers, Sarehole Road, Sparkhill, Birmirgham, 11.)

As a most valuable accessory to the Aldis Epidiascope which was first introduced last year, there is now available the sub-illuminator which serves to convert the whole apparatus into a vertical projection lantern. By means of this piece of apparatus it is possible to view by transmitted light large objects such as X-ray films which cannot be normally projected in an episcope and of which it is otherwise necessary first to make a lantern slide. The Aldis epidiascope has considerable depth under its stage and the table elevating gear is capable of being swung out of the way. In its place the sub-illuminator is arranged so that its stage coincides approximately with the $8\frac{1}{2}$ ins. circular stage opening of the episcope. Inside the illuminator is a 500 watt projection lamp, with a mirror and special condenser system to illuminate objects on the stage. The sub-illuminator is supplied complete with switch, plug connector with 20 ft. of flex, also hinged glass plates large enough to accommodate 15 × 12 ins. X-ray films; price without lamp is £10. Suitable 500 watt projection lamp with pre-centred cap is listed at £1 6s. 0d.



LEITZ FOCOMAT MODEL II ENLARGER.

(Sold by E. Leitz (London), 20, Mortimer Street, London, W. 1.)

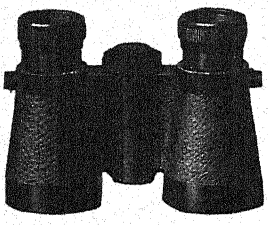
The original automatically focussing Model I enlarger for miniature negatives was reviewed in these pages two years ago, and in the meantime the more universal Model II has made its appearance. By means of two interchangeable lenses it is possible to enlarge from negatives of all sizes from Leica (1 × $1\frac{1}{2}$ ins.) up to $3\frac{1}{4}$ × $2\frac{1}{2}$ ins. The same swinging parallelogram system for raising and lowering the head is used, and by means of a very simple device, the focussing cams which are fastened to this frame are changed to suit the lens in use. For negatives up to 4 cm. square, the standard 5 cm. lens is used (which may be the camera lens), and for negatives of size up to $3\frac{1}{4}$ × $2\frac{1}{2}$ ins., a special $f/4$ 9·5 cm. Elmar lens is used. Illumination is by the usual opal bulb and double condenser of ample size, and the negatives are held between glass plates in a special

holder, which is so designed as to open when the film is moved, and also is set so as to keep the negative always in the centre of the field. A set of masks of all the standard sizes is made so as to be interchangeable without disturbing the negative in the holder. The degree of enlargement possible with automatic focus, using the 5 cm. lens, is 2 to 13 diameters, with the 9·5 cm. lens, 1·8 to 6 diameters; hand adjustment of the focus is also possible. The baseboard embodies a built-in switch and also a lever clamping device for the printing board. Price, with 9·5 cm. lens and lamp is £50 12s. 6d.

RODENSTOCK ADOR BINOCULARS.

(Sold by F. G. Phillips Ltd., 44, Farringdon Street, London, E.C.4.)

This is a neat little pair of binoculars of the Galilean (opera glass) type, which sells at a very reasonable price. Focussing is by means of the usual central screw adjustment, and a jointed centre piece enables the width between the observer's eyes to be suited. Owing to their compact form and light weight (14½ ozs.) they are handy for the tourist or naturalist. The magnification is 3½ ×, whilst the technical data gives the field of view at 1,000 yards as 172 yards. Diameter of the object lens is 38½ mm., and that of the exit pupil is 9½ mm. The price, complete in neat leather sling case, is £4 15s. 0d.



SCHNEIDER LENSES.

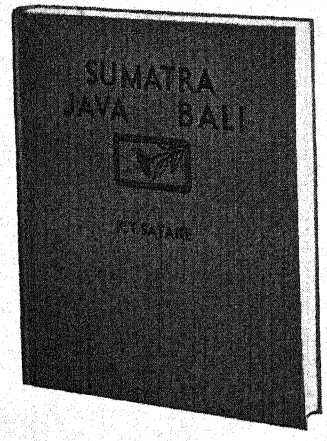
(Made by Jos. Schneider & Co., Optical Works, Kreutznach/Rhld., Germany.)

The well-known "Xenon" series of lenses has been extended by the introduction of two new lenses of focal lengths of 5 and 8 cm. respectively, both of aperture *f*/2. As a result of experience gained in the construction of lenses of this type for cine requirements it has been found possible to extend the range of available focal lengths by introducing the two lenses referred to. The "Xenon" series of lenses belong to what is known as the Gauss type of construction which consists of four or up to five air spaced components, two of which are cemented. These cemented components are placed on either side of the diaphragm and are of dispersive character. The resulting lens thus consists of six or seven single elements. This type of lens construction makes it possible, in the Xenon lens, to provide excellent correction for spherical and chromatic aberration and also distortion. Within an angle of field of 55°, astigmation and coma are also well corrected. The *f*/2 Xenon of 5 cm. (2 ins.) focus covers a field of 1⅜ × 1⅛ ins., whilst that of 8 cm. (3¼ ins.) covers up to 2½ × 1⅝ ins. Mention should also be made of the Xenon and Tele-Xenar lenses for use in sub-standard cinematography where great resolving power even at the highest of apertures, is essential. Full details of all these lenses may be gathered from catalogues sent free on request.

PRINTING, PHOTOGRAVURE AND PHOTO-ENGRAVING.

(By Messrs. Hood & Co., Sanbride Works, Middlesbro'.)

A well varied selection of specimens of all imaginable kinds of printing jobs shows how consistently high is the quality of work of which Messrs. Hood are capable. Apparently no task is too big for them, for, to judge by the magnificent book illustrated here, which consists almost entirely of illustrations, they can make it as tasteful a piece of craftsmanship as they do of a simple catalogue folder or a business letter heading. The use of photogravure for all kinds of work is now-a-days becoming increasingly frequent and it is a pleasure to look on such work when done by a firm of repute. Fine examples of half-tone work of all sizes was also to be seen, so the phrase "Blocks by Hood" stands for something more than mere advertisement and instead signifies work equal to the best. Half-tone and photogravure are not the end of the activities of this firm, letterpress printing of all descriptions is carried out with just the same taste and care as the foregoing work. Where original designs are required, or layouts to be prepared, an efficient artistic staff undertakes the work and the result is every bit as good as their excellent printing. Colour blocks in two, three or four colours can be prepared from any kind of original and the printing is excellent. Last but not least, Hoods are practical photographers and have a well equipped commercial studio capable of dealing with all sorts of tasks. Thus having a practical knowledge of photography, any user of blocks can safely entrust his blockmaking and printing to this firm in the knowledge that it will be efficiently handled.



THE SPEEDEX RECORD CAMERA.

(Sold by Agfa Photo, Ltd., 1-4, Lawrence Street, High Street, London, W.C. 2.)

The Speedex series of Agfa cameras is well known to the photographing public, and they are all much valued for their high quality of workmanship combined with very reasonable price. This new model in every way conforms with these standards, and in addition provides the advantages of a lens of high aperture and a multi-speed shutter. The camera is of the popular self-erecting type, taking $2\frac{1}{4} \times 3\frac{1}{4}$-in. pictures. The release of a push-button on the side causes the front to spring nearly out; light pressure on the baseboard completes the erection, and the front remains rigidly

locked until released by means of a catch on the baseboard which enables it to be folded up as before.

The shutter and lens enquipment are such that it is a matter for wonder how it can be done for the price. The lens is an *f*/4·5 Agfa Apotar anastigmat of 10·5 cm. focus in a front-cell focussing mount graduated in feet, and gives settings from 3 ft. to 40 ft., and then infinity. This mount works very smoothly, and has a definite stop at each end; it also is furnished with an easily legible index line. The shutter is known as the Prontor II, and gives speeds of 1, ½, 1/5th, 1/10th, 1/25th, 1/50th, 1/100th, and 1/150th, in addition to Time and Bulb. Its release is very sweet and free from "kick." A built-in delayed action device, which can be used with any of the speeds, allows an interval of ten seconds to elapse before the shutter is released. There is the usual provision for the use of a wire release which is supplied with the camera. A further point is that the settings of both the shutter speeds and the aperture numbers can be made, and read from above without turning the camera out of the taking position. There are two viewfinders, one of the usual reflecting type, and the other a small folding direct-vision frame finder. The camera body, on being opened, reveals a sprung pressure-plate the full size of the picture. The winding key works smoothly and silently. The cradle into which the loaded spool fits is arranged to swing out, and has a hinged end. The body is of all-metal construction, and is covered with leather, external fittings are nickelled, and two tripod bushes are provided. The red film window is fitted with a neat built-in safety cover which springs back easily, thus rendering it suitable for use with any kind of film without the necessity for any further alteration.

The quality and workmanship of this camera are excellent; it should achieve considerable popularity, since its price is only £5 5s. 0d.

THE IKOFLEX MODEL II CAMERA.

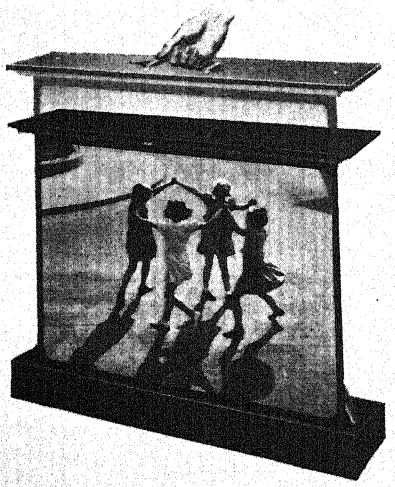
(Sold by Zeiss Ikon Ltd., Mortimer House, Mortimer Street, London, W.1.)

The previous model of this twin lens reflex camera, the Ikoflex I, was reviewed two years ago, and this new model embodies certain improvements. Apart from the difference of finish, due to certain external parts being chromium plated, the shape is slightly altered, on account of differences in design of the focussing system and film transport mechanism. The image in the finder is focussed by means of a quadrant lever on the left of the camera which also embodies a depth of focus scale; the same plano convex ground focussing screen is used and gives even illumination right into the corners. Film transport, instead of being by means of a lever on the front of the camera, is now carried out by means of a large knob on the right of the camera, near which is the exposure counter. The principal difference lies in the lens and shutter equipment; the lens is either a Zeiss Tessar or Triotar of *f*/3·5 or *f*/3·8, respectively, whilst the shutter is the well known Compur Rapid, with speeds up to 1/500 sec., or the normal Compur, speeded to 1/300 sec. The prices are £20 10s. for the Ikoflex with Tessar and £14 15s. with Triotar.

THE DUO CELFIX SCREEN.

(Made by R. F. Hunter, 51, Gray's Inn Road, London, W.C. 1.)

Celfix screens for cine projection are quite sufficiently well known to require no further introduction here, but it will be realised that, on account of the horizontal oblong shape of the cine picture, and consequent shape of the screen, it does not lend itself particularly well to the projection of square or upright pictures such as are produced sometimes in lantern or epidiascope projection. When it is necessary to project an upright picture on to a cine-shape screen it results in a considerable waste in screen space and consequent shortening of the projection distance, either or both of which may not be convenient. The Celfix Duo screen is arranged in the usual box when rolled up, and is made ready for use merely by releasing a catch near the handle on the lid and gently pulling up until the screen will unroll no further. This gives a horizontal or cine-shaped screen. If it is desired to project on to a square screen it is only necessary to grasp the handle at the top of the screen again, press on the catch and pull, whereupon the screen will unroll still further so as to produce a square screen suitable for lantern or epidiascope projection. The closing up of the screen is just as simple; the top is pressed down with one hand, and, in turn, the two locking buttons on the sides of the struts at the back of the screen are depressed. This causes the extension first to roll itself up, after which the whole lot can be rolled up in the normal way. These screens are only made in the glass beaded surface, and are available in three sizes only:—No. 1, sizes 40 × 30 ins. and 40 × 40 ins., £9 15s. 0d.; No. 2, sizes 52 × 40 ins. and 52 × 52 ins., £12 15s. 0d.; No. 3, sizes 63 × 47 ins. and 63 × 63 ins., £19 2s. 6d.



STUDIO LIGHTING EQUIPMENT.

(Made by D. Walter & Co., 61-63, Lant Street, London, S.E. 1.)

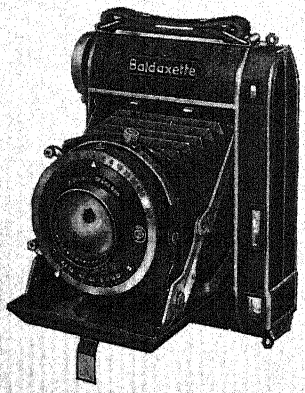
Lighting equipment of all descriptions is the specialised business of Messrs. Walter, and they can cater for literally every requirement. For photographic studio purposes they have available a wide range of floodlights, spotlights, and general illumination units of various types. Amongst these we would specially draw attention to the

" Brite-lite " portable floodlight which comprises a conical reflector of polished aluminium with screw adaptor for Photoflood or Nitraphot lamps, mounted on a circular flange base, or alternatively on a folding, adjustable stand. Equipment such as this will prove itself of great help in outside commercial jobs. As a complement to this flood light, there is also a portable spot-light, of the same series, for use with a 250-watt Osram projector lamp. It is easily focussed, and can be fitted with daylight and diffusing screens, and also a device for concentrating the beam down to a small spot. These are, so to speak, the babies of the family, the others being bigger models for serious studio use. The " Brite-lite " studio floodlight is a large 1,000 watt model on a substantial stand which can be extended to six feet in height when needed ; the base is mounted on rubber castor wheels for easy studio manipulation. Last, but by no means least, comes the 500 watt or 1,000 watt studio spot. Mounted on wheels as is the flood, its double-cased housing contains the projection bulb, the full power of which is utilised by means of a concave mirror reflector in conjunction with the plano-convex condenser-lens, and, as in the case of the portable spotlight, a supplementary device can be added to produce a still more concentrated beam or spot. A special catalogue of studio lighting equipment has now been prepared which is extremely comprehensive ; it will be well worth while for any who are considering equipping or modernising their studio to consult this catalogue which is available on request.

THE BALDAXETTE II CAMERA.

(Sold by Norse Trading Co., Ltd., 37, Rathbone Street, London, W. 1.)

A neatly made, self-erecting camera is this, and one which possesses a remarkable number of special features at a low price.



It takes twelve pictures on an 8 exposure $3\frac{1}{4} \times 2\frac{1}{4}$ roll film, and by means of a winding knob with a simple stop combined with a ratchet it is possible to wind on the film without paying attention to the observation window. Focussing works by means of a substantial knob which moves forward the whole camera front on a helical screw, and at the same time shows the distance setting. Simultaneously, a built-in rangefinder of the split image type is operated, and so ensures perfect sharpness. The viewfinder is coupled internally with the rangefinder and moves in a suitable manner to correct parallax. The camera is strongly made, and is covered with leather with plated edgings. The lens supplied is a Schneider Xenar $f/2{\cdot}8$, and is fitted into a Compur shutter with delayed action. The price is £18 5s. 0d.

THE ELECTRODREM EXPOSURE METER.

(Sold by Drem Products Ltd., 37, Bedford Street, London, W.C. 2.)

This new photoelectric meter possesses certain very useful features all of which are not to be found on one meter. The instrument consists of a photo-cell which embodies a meter and a calculator which forms the handle. A metal hood, which folds down to cover the front of the cell when not in use, serves to shield the cell from top light, the reading is taken from a scale of letters, as shown. Before use, the calculator is set to the DIN or Scheiner speed of the film, and in this setting, account can be taken of the filter factor, or whether the exposure is to be made by artificial light. The calculator then shows the exposure for any stop in column form under the letter read off the dial. Provision is also made for very weak light by taking a reading of the source; for this an extra scale, in red, is provided. The price of the Electrodrem is £3 15s. 0d.



THE FOTH FLEX CAMERA.

(Sold by Peeling & Van Neck, Ltd., 4-6, Holborn Circus, London, E.C. 1.)

This camera is of the twin lens reflex type and takes the usual 2¼ ins. square pictures, but differs from most by being fitted with a focal-plane shutter. This shutter gives a wide and well graded range of speeds with eleven settings from 2 sec. up to 1/500 sec. and also bulb exposures. In addition, there is a delayed action device to the shutter which operates on any of the speeds and gives an interval before making the release, of about 10 sec. The film transport mechanism also has an exposure counting device. The focussing hood incorporates a magnifier for critical adjustment. The choice of lenses lies between either the 75 mm. Foth anastigmat $f/3{\cdot}5$ or $f/2{\cdot}5$; the price is either £10 7s. 6d. or £13 10s. 0d.

THE FINLAY COLOUR PROCESS.

(Made by Finlay Colour (London), Ltd., 174, Mill Lane, Hampstead, London, N.W. 6.)

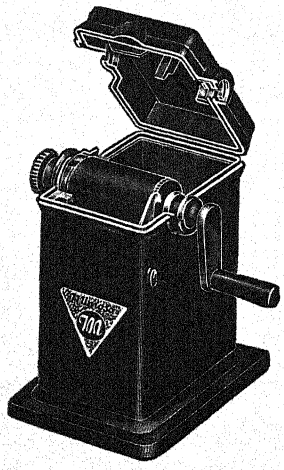
The principles of the Finlaycolour process are sufficiently well known to make it unnecessary to repeat them here. Certain improvements have taken place as a result of better and more suitable sensitive materials becoming available. By the use of either Ilford Hypersensitive or Barnet Ultrasensitive Panchromatic plates, a considerable increase in the latitude of exposure is possible. Since this process, as normally worked, is a negative-positive one and not reversal, quite considerable variations from the correct or minimum exposure are possible without any sacrifice in colour rendering. Of course, gross over or under exposure are both to be avoided. When working by artificial light Messrs. Finlay Colour, Ltd., recommend the use of the Barnet Ultrasensitive plate which, on account of its different colour sensitivity, requires the use of a

much less dense compensating filter and so enables exposures of considerably shorter duration to be given. It is, they state, three times the speed of Hypersensitive under these conditions. By constant investigation and use of new dyes still better colour reproduction has been made possible, whilst improvements in manufacture have resulted in a greater uniformity in the material and consequently greater consistency of results.

MIMOSA FILM SPOOLING BOX.

(Sold by Luminos, Ltd., 22, Bartlett's Buildings, Holborn Circus, London, E.C. 4.)

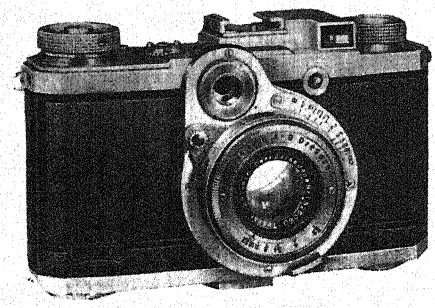
For users of miniature cameras of the type which take pictures 1 × 1½ ins. on standard 35 mm. cine film, this Mimosa film spooling box, which is a neatly moulded product in black bakelite, offers the considerable advantage of the use of unspooled lengths of such film without the normally attendant drawback of darkroom loading. For use in conjunction with this spool box there is available a special packing of Mimosa film which is divided up into lengths of either 18 or 36 exposures each of which is already cut and specially tapered for loading into either a Leica or Contax spool-chamber or reloading a Mimosa cartridge. These lengths are not separated from one another but are joined by a small tongue of film which may easily be torn off when the chamber is loaded. Very briefly, all that it is necessary to do is to insert the special package of film in the bottom of the box, open the lid at the top, attach the tapered end of the film which is projecting ready from the package into the centre spool of the cassette. When the lid of the box is closed, the film may be wound into the cassette and the handle is automatically locked when the spool chamber is full. The box can then be opened and the film torn off at the proper place which leaves a tongue projecting ready for the next loading. The special packing of Mimosa film (so-called extraction boxes) for this purpose is available in sizes filled with either six or ten lengths of film ready cut in either of the two kinds of Mimosa film, Extrema or Panchroma, made in this form. It will be seen that in addition to its great value to either the serious amateur or the professional using the miniature camera for his work, this spooling box should be useful to the dealer for rapidly reloading customer's spool chambers without having to leave the counter and retreat to the darkroom as formerly was necessary. The price of the Mimosa film spooling box is £1 7s. 6d. while the special packing of film for use with it costs 11s. 6d. for six thirty-six exposure lengths.



THE NETTAX.

(Sold by Zeiss-Ikon, Ltd., Mortimer House, Mortimer Street, London, W. 1.)

Still another addition to the already wide range of Zeiss Ikon miniature cameras is the Nettax, which takes the usual 24 × 36 mm. negatives on standard 35 mm. cine film. From its general shape and constructional principles it will be seen to fall into place between the Super Nettel and Contax series of cameras; on account of certain affinities it had with the Super Nettel, it was foreshadowed at the Leipzig Fair as the Super Nettel III, although the similarity is principally that of size. Instead of the construction with struts and bellows, the lens has been provided with a tubular collapsible mount somewhat similar to that of the Contax 5 cm. lenses, which is simply pulled out to a definite stop and locked in the usual way by a small turn to the right. Focussing is extremely neat. Merely by rotating the focussing lever through about an eighth of a turn the lens can be set on any distance from 3½ ft. to infinity. At the same time as setting the lens in focus, the rotating wedge component of the built-in, short-base rangefinder is operated, thus automatic focus is ensured. Further, the lenses have been made interchangeable, and, in addition to the standard 5 cm. lens normally used, there is an *f*/8 wide-angle Tessar of 1¼ in. focus and a long-focus Triotar, 4⅛ in., and aperture *f*/5·6. Each lens, with the exception of the wide-angle, has its own rotating wedge component built into the mount. Certain accessory apparatus, such as the Contameter near-focussing device, can be used with the Nettax, and thus considerably increases its sphere of usefulness. The price is £29 5s. 0d. with *f*/3·5 Tessar, or fitted with *f*/2·8 Tessar it costs £32.



ENSIGN OPTISCOPE TRAVELLER MODELS.

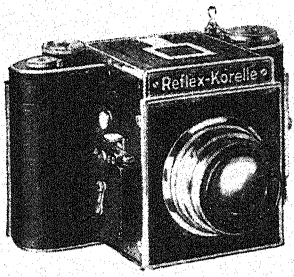
(Made by Ensign, Ltd., 88-89, High Holborn, London, W.C. 1.)

These models are designed for the use of people lecturing in places having voltages which differ. By means of a variable resistance the lamp can be run at full efficiency which is rapidly and easily set to suit the voltage of the supply. The bulb is either 100 watt or 500 watt of voltage 100, so that any supply between 100 and 250 volts can be suited. The projector folds up and the lens detaches in such a way that the entire equipment may be placed in a strong fibre suitcase. Complete with resistance, lamp and projection lens, this Optiscope costs between £9 15s. 0d. and £19 10s. 0d. according to the lens and type of lamp employed.

REFLEX KORELLE CAMERA MODEL II.

(Sold by Photo-Optics, Ltd., 32, Lord Street, Liverpool 2.)

The Reflex Corelle is a mirror reflex instrument with focal p. shutter and it makes 12 negatives of size 2¼ ins. square on t. standard type of No. 20 spool roll film. It is a soundly constructed instrument of excellent finish and combines a large number of refinements and improvements on the previous model. The winding mechanism for the focal plane shutter, which works by means of a small crank handle type of lever on the top of the camera, is coupled up to the film transport mechanism and, at the same time, automatically counts the pictures. The shutter is speeded from 1/500 down to two seconds giving altogether eleven shutter speeds excluding bulb exposures. In conjunction with this is a built-in delayed action device which allows an interval of about 10 seconds to elapse before releasing the shutter on any one of those speeds. The top springs up to form a hood for the focussing screen and in the hood is a magnifier for fine focussing. The focussing movement of the lens, which is a Zeiss Tessar *f*/3·5 of 8 cm. focus, is on the lens mount itself. A further improvement in this model is the direct vision, frame-type view-finder which is useful for sports and other action pictures. The back sight of this finder can be seen folded down on the top of the camera, and when in use it snaps into the upright position on a hinge. The front frame is most ingeniously concealed in the front lens panel into which it slides when not in use from which position it is simply pulled out. The lens mount is removable by unscrewing and lenses of longer focus are also available. This camera is a very serviceable instrument and at the price of £22 10s. 0d. represents good value for money. This price includes a wire release and neck strap.



AGFA FINAL LIQUID DEVELOPER.

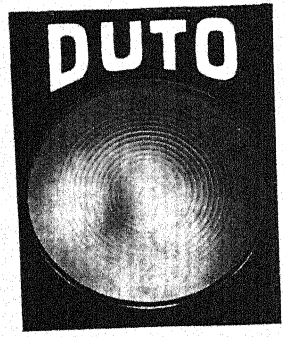
(Sold by Agfa Photo, Ltd., 2-4, Lawrence Street, London, W.C. 2.)

Agfa " Final " fine grain developer in powder form is well known to the photographic world in general and its excellent qualities are appreciated by miniature camera workers. The fine grain and so called compensating quality of producing a negative of soft gradation and harmonious contrasts even with contrasty emulsions which is a characteristic of this developer in its powder form is also present in just the same extent in the liquid Final developer. This liquid is in very concentrated form, and for use in the normal way it is meant to be diluted with 15 parts of water. The advantage of using a developer in liquid form is that the preparation of the actual developing solution is merely a moment's work and time is not wasted in waiting for the solution to cool.

DUTO SOFT-FOCUS ATTACHMENTS.

(Made by R. F. Hunter, Ltd., Celfix House, 51, Gray's Inn Road, London, W.C. 1.

For a useful addition to the accessories of those workers who are interested in achieving pictorial effects by means of soft-focus, the "Duto" diffusing disc will prove very practical. This accessory is extremely well made and finished, and consists of a glass disc mounted in a cell which is simply slipped on the front of the lens-mount in the same way as a filter would be used. The mount is so made that in conjunction with it a filter or a lens-hood can be employed. The use of this latter accessory cannot be too strongly commended for two reasons; the addition of another pair of air-glass reflecting surfaces to the optical system introduces additional danger of fog and flare in the negative, and in addition quite a number of the best soft-focus effects are achieved by photographing into the light. As regards the diffusing disc itself, it is a sheet of clear glass with concentric circular markings. In the centre is a small, clear space which varies in size with the diameter of the "Duto." It is recommended by the makers that when using a camera of the ground-glass screen type focussing should be carried out first before putting the diffusing disc in front of the lens.



The "Duto" is made in two degrees of softness, Nos. 0 and 1, and in a variety of sizes to fit all manner of lenses from 25 mm. to 80 mm. diameter, and special mounts are available to fit lenses of the Rolleiflex, Leica, Contax, and certain other special cameras, and the prices range upwards from 15s. 6d.

THE "WELLCOME" EXPOSURE CALCULATOR, HANDBOOK AND DIARY FOR 1937.

(Sold by Burroughs Wellcome & Co., Ltd., Snow Hill Buildings, London, E.C. 1.)

The number of questions which can be answered by a careful search in the right part of this extraordinarily useful little pocket book can only be appreciated by trying it for one's self. The information to be found in it can always be relied upon to be as up to date as is possible in the printed word and correspondingly accurate. The exposure calculator and the light tables which accompany it are, perhaps, its best known features, so it is pretty safe to say that this calculator is certainly the most reliable one at the price. As an example of the constant revision and incorporation of new material which goes on each year, there are now included the directions for processing Dufaycolor by means of 'Tabloid' products. The tables of paper, plate and film speeds have also had new materials incorporated. As usual, the price is 1s. 6d. which is no scale of its real value.

CHANGING BAGS, DEVELOPING TENTS AND FOCUSSING CLOTHS.

(Made by F. Beresford, 20, Melody Road, Wandsworth Common, London, S.W. 18.)

The focussing cloth and changing bag were part of the equipment of every amateur, as well as professional photographer until only a few years ago; such, however, is the state of enlightenment of present-day photography that there are many able workers who hardly seem to know of the existence of such useful accessories. To the owner of a changing bag or tent, the absence of a dark room hardly matters, since he can use it for almost every photographic purpose which requires darkness. For changing and loading plate holders and ciné magazines a changing bag of the "Eclipse" type is sufficient, since on account of the almost universal use of panchromatic materials it is not possible to see and loading must be done by touch. Prices of bags of this type range from 15s. for one suitable for ¼-plate work up to whole plate size at 25s. For those operations where a red light is permitted, there is the "Paragon" bag which has a ruby window and a ruby glass eyepiece. It is very light and in the ½-plate size, which costs 25s., it weighs less than a pound. For changing and loading ciné magazines, there is a special "Zipp" bag, which as its name suggests has a light-trapped zipp-fastener for insertion and removal of the large magazines. This is extremely valuable when working on location where darkroom facilities are absent. These "Zipp" changing bags range in price from £1 16s. 0d. for a bag of size 25 ins. square up to £2 12s. 0d. for one 36 ins. square. All materials used in construction are of finest quality and are carefully tested; the bags are made of three thicknesses of material whilst the placing of the seams ensures absolute light-tightness.



ILFORD GELLODION STRIP FILM.

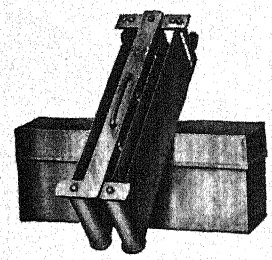
(Made by Ilford, Ltd., Ilford, London.)

This material should be of very great interest to the process worker. It consists of a very contrasty emulsion specially coated on to a paper base. For use, it is attached to a glass plate by means of a suitable temporary adhesive and used in the dark slide as usual. The speed is approximately that of a wet plate, but it possesses certain features which a wet plate does not have. After exposure, the paper is separated from its support, developed, rinsed, fixed and washed. At the end of these processes the developed image comes away readily from its paper base, whereupon it can be transferred to a glass plate and rapidly dried. It is possible to complete a wet negative within the space of 8 minutes. The great advantage of this new material is that the results compare very favourably with those from a wet plate, but in addition, the film can be stripped and inset as required as well as very rapidly handled. In view of these special properties and unique advantages, Gellodion strip film deserves the attention of all photomechanical workers.

BEDA DEVELOPING TANKS.

(Sold by Luminos, Ltd., 22, Bartlett's Buildings, Holborn Circus, London, E.C. 4.

This is a developing tank constructed entirely of metal but the metal is such that it is not attacked by any developing or fixing solution, nor does it affect the solutions themselves. It consists of two parts; there is a metal box with a deep, well fitting lid and inside this box is placed the frame arrangement on which the film is wound for processing. The box itself is well finished and has all its seams welded and carefully smoothed so as not to harbour traces of solutions which might contaminate subsequent processing operations. The frame for holding the film is so made as to hold the film only by its edges. The actual loading operation is quite simple and only requires the ends of the film to be fastened under a pair of clips at either end in addition to forming it in loops over the intermediate rollers as the illustration shows. The tank with the frame in place holds approximately 20 ozs. which is fairly standard and provides for an ample sufficiency of solution. Three sizes of this tank are made: $4\frac{1}{2} \times 6$ cm. (V.P.) films at 25s., $3\frac{1}{4} \times 2\frac{1}{4}$ ins. films costs 27s. 6d., whilst a tank of this type for Leica films sells for 30s.



KODAK TIME-STANDARD DEVELOPER.

(Made by Kodak Ltd., Kingsway, London, W.C. 2.)

As the result of a prolonged and detailed investigation both in the laboratory and in conjunction with the main D. & P. processing houses in this country and a statistical examination of the quantities of the different grades of gaslight papers used throughout the year, a new tank developer for D. & P. use has been evolved by Kodak Limited. By means of this developer, it is possible to give one time of development to all Kodak roll films and achieve the same contrast in all cases, provided the temperature is maintained constant. In the same way, by reason of its composition it is only necessary to add replenisher to it to keep up the level in the tanks, the time of development remains constant. A carefully worked out time and temperature table enables the exact development time to be given for the working temperature in use. The whole process is almost automatic and negatives of correct contrast are assured.

THE LARGODREM ENLARGING METER.

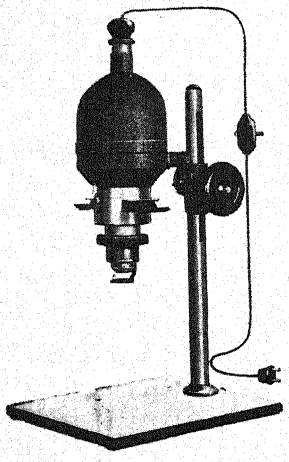
(Sold by Drem Products Ltd., 37, Bedford Street, London, W.C. 2.)

Exposures during enlarging are made simple and certain when the Largodrem is used. This useful accessory has been on the market for some time now and so has stood the test of time. As a result of the experience gained, the paper speed testing device, which was formerly listed as an accessory, is now supplied with the meter itself and, it has been found possible to keep the price the same, namely 30s. complete.

THE EXAKTA ENLARGER AND PROJECTION-LUMINAX.

(Sold by Garner & Jones, Ltd., 29-30, Polebrook House, Golden Square, London, W. 1.)

These two enlargers, of which we illustrate here the Projection Luminax, are both designed for use with the interchangeable lens of the Exakta camera. They are arranged so as to take negatives of size up to 6 × 6 cm. (2¼ ins.), but the difference between them lies in the fact that the Projection-Luminax, as its name suggests, can be used either as a projector or else as an enlarger, whilst the other model is an enlarger only. The Exakta enlarger is solidly built of wood and covered with leatherette; the body is white enamelled inside and ventilated. For V.P. size negatives a special mask is supplied, and from this size it is possible to make enlargements up to 12 × 20 ins., or even larger. Illumination is by means of an opal bulb in conjunction with an opal diffuser. The price of the Exakta enlarger is £4 10s. 0d. The Projection-Luminax is of all metal construction. The lamphouse, which is of aluminium and contains an opal lamp and a four inch double condenser, gives an intense but even illumination. The Exakta lens is used and focussed by means of a built-in helical mount. It is supplied with an orange filter, and its maximum degree of enlargement is 15 diameters. By swinging the head round so that it is horizontal, the apparatus can be used as a projector for either small glass slides or films; the film mask is exchanged for a slide carrier and brilliant pictures up to 18 × 24 ins. can be projected. The price of the Projection-Luminax is £10 10s. 0d. without lens or lamp.



THE K.W. MASKING FRAME.

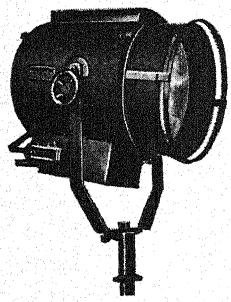
(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 1.)

This is a very solidly constructed masking frame which can be used direct on the baseboard of any enlarger; it has no base but holds the paper flat by its weight alone. It need not be feared when using it that it will necessitate any re-adjustment of an automatically focussing enlarger since the level of the paper is unchanged. A single screw serves to adjust the width of border obtainable which ranges from ⅛ in. to 1½ ins. and marks are provided for setting the masking bands to the most commonly used paper sizes. The wide bearings on which the masking bands run ensures that they will always remain square and so give a square picture with a regular border.

2000-watt KANDEM SUNSPOT.

(Made by Kandem Electrical, Ltd., 769, Fulham Road, London, S.W. 6.)

This new spotlight is entirely new in design and it has the special advantage of producing a beam of high efficiency which can be varied between an angle of 10° and 45°. The light is of a hard-soft nature and is evenly distributed at all beam divergencies and is without striations or filament ghosts. This latter property is due to the special front lens which is of the Fresnel type and breaks up the filament image. The Sunspot is therefore particularly suitable for such uses as back-lighting, cross-lighting and modelling. The optical system, which consists of a concave mirror placed at a suitable distance from the projection bulb in conjunction with the stepped front lens, allows of excellent control of the beam by means of an iris shutter. The advantage of such control is that it does not alter the colour values of the projected light but only alters the amount of light transmitted. The lamp and mirror are capable of being focussed within the lamphouse and locked in any position by a set-screw. The lamphouse is well ventilated, as it must be to house a 2,000 watt two-pin projection lamp. The stand has movements to allow the lamp to be swung as well as raised and lowered and clamped in any position. The base has three castors which allow it to be easily moved about. The Kandem Sunspot is listed at £17 10s. 0d. including the stand, while the suitable 2,000 watt bulb costs £4 5s. 0d.



ILFORD PORTRAIT PANCHROMATIC FILM.

(Made by Ilford, Ltd., Ilford, London.)

The objections commonly levelled at the use of panchromatic emulsions for portrait work by half-watt illumination are the over-corrected rendering given to anything having a reddish colour such as flesh tones and the excessively dark tones of blue fabrics and also blue eyes. The introduction of this new portrait panchromatic film has, however, necessitated a change of viewpoint, since on account of its somewhat different colour sensitivity distribution it is so balanced as to give a very much improved rendering of these colours under half-watt lighting in the studio. The speed too, is very high; it is approximately 1½ times as fast to half-watt light as Hypersensitive Panchromatic film. The emulsion is double coated, which in conjunction with the anti-halation backing, will give a faithful rendering of subjects having even the longest scale of gradation. It can also be supplied without the anti-halo layer but with a matt backing. Despite the very high speed, this new emulsion has remarkably fine grain and thus will stand a fair degree of enlargement. This new panchromatic material should prove of considerable interest to all portrait workers.

HAUFF MIKROL 36 DEVELOPER.

(Made by Hauff A.G. Chemical Works, Stuttgart-Feuerbach, Germany.)

The rapid strides made by miniature photography make it necessary for every D. & P. works to be capable of efficiently processing miniature negatives by modern fine grain methods. Mikrol 36 is a tank developer of the fine-grain, compensating type which necessitates no increase in exposure. It is of such a composition that miniature negatives may be developed in it side by side with those of larger size without detriment to either the grain or gradation. Its advantages for trade use are thus obvious. By virtue of its special composition, even the hardest water does not produce a precipitate or a scum on the film. Its time of development is in the neighbourhood of 11 to 13 minutes at normal temperatures. The working life and keeping qualities are superior to the previously made Mikrol tank developer. It is supplied in packings suitable for either 65-70 litres, 40 litres and in 5 litre packings for replenishment of losses during use.



ORELUP NEGATIVE INTEGRATOR.

(Sold by G. H. Potts Ltd., 7-9, Baker Street, London, W. 1.)

This device consists of a metal frame which contains a special lamp to illuminate a window over which a strip of 35 mm. miniature negatives is placed. The transmission of each negative may be separately measured by this device in conjunction with either a Weston Universal or Leicameter. It is claimed that by this means, it is possible to determine the correct printing time, degree of contrast, fog and general characteristics of each negative. Special record sheets are supplied on which all data is noted ; this simplifies darkroom work since the negatives may be measured at any convenient time.

ENSIGN MAGNAPRINT ENLARGERS.

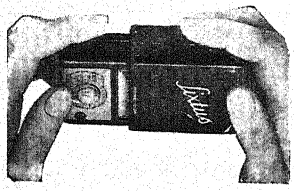
(Made by Ensign Ltd., 88-89, High Holborn, London, W.C. 1.)

These enlargers are available in two series, with either automatic or hand focussing, and of special interest is the new model with a friction drive raising mechanism for the enlarger head. The Model V/10, for negatives up to $2\frac{1}{4}$ ins. square with Ensar $f/6{\cdot}3$ anastigmat costs £7 15s. 0d., and with $f/4{\cdot}5$ Magnar £9 10s. 0d. The larger model V/11 for negatives up to $2\frac{1}{4} \times 3\frac{1}{4}$ ins., costs £8 10s. 0d., or £10 0s. 0d. with the same optical equipment. The illuminating system is a $4\frac{1}{2}$ in. double condenser in conjunction with a 100 watt opal bulb, whilst focussing is by a helical screw mount furnished with a locking screw and a swing-in orange cap. The degree of enlargement varies between $1\frac{1}{2}$ and 6 diameters.

THE SIXTUS PHOTO-ELECTRIC EXPOSURE METER.

(Sold by J. H. Dallmeyer, Ltd., 31, Mortimer Street, London, W. 1.)

The small and neat shape of this meter is attractive to the eye, and being rounded at the corners it fits the hand and the pocket comfortably; in its self-contained bakelite ever-ready case it weighs only 5 ozs., and its overall measurements are $2\frac{1}{2} \times 2\frac{1}{4} \times 1\frac{1}{4}$ ins., which gives an idea of its compactness. Despite this small size, the sensitivity is amazingly high: a readable deflection is obtained at 1/10th foot lambert—the luminosity, say, of a piece of white paper at some 20 ft. from a 60 watt lamp. Two ranges of intensities are provided for by the well-known double scaling method, the readings in bad lights, such as dull interiors, being obtained by pressing a small red knob on the top of the instrument; the two scales together show direct readings of exposure times of from 1/500th sec. down to 2 minutes; these readings are then translated into shutter speeds by means of a remarkably simple and rapid calculator, which incidentally can be operated with the meter held only in one hand. Film speeds are shown in both degrees DIN and Scheiner, and all that has to be done is to set the meter reading against the speed of the film in use, whereupon the correct exposure is given opposite the stop numbers, which range from $f/1{\cdot}4$ down to $f/45$, and shutter speeds from 1/1,000th sec. to 4 minutes.



For outdoor work, the cylindrical lens feature which was already incorporated in the Ombrux is used in almost the same form to restrict the angle of view and to exclude, for instance, unwanted sky which would lead to false readings.

For Leica users, there is a specially scaled model of the Sixtus which conforms with the shutter speed markings and stop numbers on this camera. In all other respects it is identical with the standard Sixtus meter. The price of both types of this meter is £5 5s. 0d.

THE SIMPLEX DAYLIGHT DEVELOPING TANK.

(Sold by Westminster Photographic Exchange, Ltd., 24, Charing Cross Road, London, W.C. 2.)

The Simplex tank is constructed entirely in moulded bakelite, it is for $3\frac{1}{4} \times 2\frac{1}{4}$ films, and is capable of being loaded and operated throughout in daylight. It is so constructed that as the covering paper of the film is drawn away through a light-trapped slot from the outside, the film threads itself on to the spiral inside the tank. In the lid is the aperture for filling the tank with the necessary solutions and into which a thermometer can be placed. The whole sequence of operations of developing, rinsing, fixing, can be done in the tank, but washing is recommended to be carried out in a separate container. The capacity of the tank is approximately 17 ozs. and its price is 37s. 6d.

STAINLESS STEEL DEVELOPING DISHES AND ACCESSORIES.

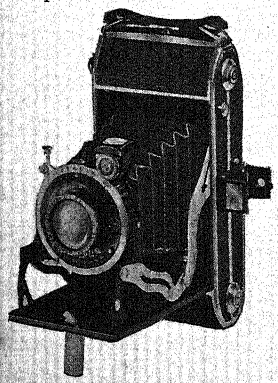
(Made by N. J. Bowyer-Lowe, 3, Commerce Lane, Letchworth, Herts.)

It is surprising, in view of the enormous popularity of stainless steel in the home and its extensive industrial uses that it is not more used by photographers. The explanation may lie in long tradition of earthenware dishes and tanks to which we have been used, which causes us to regard all metal containers with suspicion, or it may be that we have never had the chance of changing to dishes and tanks of a less fragile nature. In any case, neither of these excuses are of any value now, since it has been abundantly proved that none of the normal photographic solutions are either affected by or effect stainless steel. Also the presence now of suitable tanks and dishes rules out the excuse that they were not there to use. These stainless steel developing dishes are made in sizes ranging from $4\frac{1}{2} \times 3\frac{1}{2}$ ins. at 5s. 4d. up to 16×13 ins. at 18s. 8d., all $1\frac{1}{2}$ ins. deep. Any special size can be made to order and will be quoted for. As the corners are welded with stainless steel they are quite proof against corrosion, and since they are practically indestructible they are well suited for hard use, such as the D. & P. industry. Of interest too in this connection are stainless steel weights for deep tank development of miniature films; these cost 5s. per dozen.

THE NORFOLK ROLL FILM CAMERA.

(Sold by Sheffield Photo Co., Ltd., 6, Norfolk Row, Sheffield 1.)

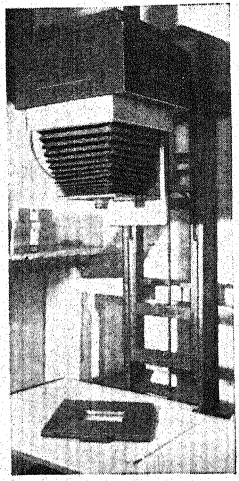
These cameras are of the popular self-erecting type and take standard $3\frac{1}{4} \times 2\frac{1}{4}$ roll film. By means of a separate film mask, it is possible to use the camera for either the full-size or the half-size picture as desired. It is a matter for congratulation that, taking into consideration the low price, such a high standard of optical and shutter equipment can be offered. The viewfinder is of the optical direct vision type which folds flat on the side of the camera and springs up at the touch of a small button. A similar button controls the swing in mask for use when taking half-size pictures. There is also a reflex finder provided. The body is of all metal construction and has nickelled fittings. There are two models of this camera available; both are fitted with the $f/3{\cdot}8$ Zeranar lens, but the shutters provided are different. The camera with Prontor II shutter, giving speeds from 1 to 1/150 sec. and delayed action, costs £4 19s. 6d. With Compur delayed action shutter, the price is £6 6s. 0d.



NEW MINEX VERTICAL ENLARGER.

(Made by A. Adams & Co., Ltd., 122, Wigmore Street, London, W. 1.)

As a new introduction by Messrs. Adams, this Minex vertical enlarger is well worthy of attention. It is designed essentially for the worker used to really large size plates and in this respect fulfils the requirements of, for example, the commercial or professional photographer who needs to make enlargements from negatives of sizes up to whole plate. As might be expected, it is very soundly constructed of seasoned walnut and is everywhere of solid workmanship. The illuminating head is raised and lowered by means of a rapid screw thread worked by a crank handle whilst the focussing is carried out using a rack and pinion. It possesses a very long extension so that reductions are possible in addition to small degrees of enlargement. The bellows are of the best leather and withstand constant and considerable use. The lamphouse is of metal and is well finished; it is properly ventilated in order to guard against the possibility of overheating either the condenser, or, more important, the negative. The size in which the enlarger is made for stock is whole plate, but other sizes can be made for special requirements to order. Two types of illumination are available, either half-watt bulbs, price £25, or fitted with mercury vapour lighting it costs £43. Both these prices, of course, refer to the whole plate size.



NEW CORONET PRODUCTS.

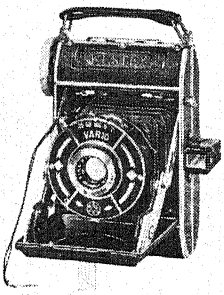
(Made by Coronet Camera Co., 310, Summer Lane, Birmingham 19.)

There two new Coronet lines which are being introduced by this firm for the coming season, they are the Coronet Model II projector for 9·5 mm. films and the Coronet Vogue Camera. From advance information, we understand that the Model II projector is to possess the following points: sprocket drive, self contained resistance, 5 : 1 ratio geared rewind, accelerated intermittent movement for the elimination of flicker, and is to take 30, 60 or 400 ft. reels without adjustment. The price of the hand driven model will be £5 5s. 0d., and a motor unit to fit inside the base, £2 5s. 0d. The Vogue camera is a streamlined model in bakelite of light weight, it takes pictures 50 × 30 mm. on a special film, its overall dimensions are $4\frac{1}{2} \times 2\frac{7}{8} \times 1\frac{1}{4}$ ins. It is self erecting and is fitted with a meniscus lens $f/10$ and direct vision finder. The Coronet Camera Co. are also the English agents for the well known products of the firm of O. Perutz of Munich, who manufacture a wide variety of sensitive materials including special fine grain films for miniature cameras.

THE WESTEX MINIATURE CAMERA.

(Sold by Westminster Photographic Exchange, Ltd., 119, Victoria Street, London, S.W.1.)

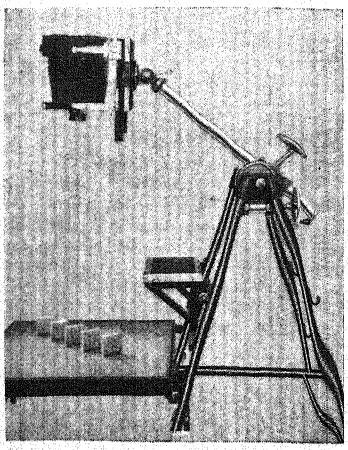
There are two models of this little camera which takes 16 negatives, of size 3 × 4 cm., on standard V.P. size film. Both are of the folding, self-erecting type and spring completely open at the touch of a button; the lens front is extremely rigid. The body is well constructed and is covered with leather cloth; its overall size is only 4 × 2½ × 1½ ins. The view-finder is of the optical, direct-vision, tubular type. The sole difference between the two models lies in the lens and shutter equipment. The cheaper model, price £3 12s. 6d. is fitted with *f*/4·5, 5 cm. Vidanar lens in a three-speed Vario shutter. The lens focussing, as on the other model, is by front lens-cell from 3 ft. to infinity. The other model, which sells at £5 12s. 6d. has *f*/2·9, 5 cm. Radionar in a Prontor II shutter with delayed action. Both cameras are provided with a tripod bush.



KODAK COMMERCIAL STUDIO STAND.

(Made by Kodak, Ltd., Kingsway, London, W.C. 2.)

Unusual angles demand an unusual stand, and as the photographic world seems to be agreed that the "angle shot" has come to stay, so the Kodak commercial studio stand should satisfy every need required of it in present day commercial work. As the figure shows, it is very solidly constructed and is so designed as to allow the camera to be placed in absolutely any position, any angle, even upside down, from seven feet above the ground down to floor level. By means of readily accessible controls, it can be rapidly adjusted to any of its positions and firmly locked there at any angle. By standing on a step, the operator can focus and compose the picture, even with the camera at its maximum height. A special commercial bench with a glass top can be fastened on as shown, for photographing small objects. Finally, the whole stand can be easily moved about. Its price is £30, commercial bench, £1 15s. 0d. extra.



SIMMON ACCESSORIES FOR MINIATURE PHOTOGRAPHY.

(Sold by G. H. Potts Ltd., 7-9, Baker Street, London, W. 1.)

The drying of miniature negatives frequently presents considerable difficulty on account of the danger of dust sticking to the wet emulsion. Rapid drying is still more dangerous, as heat may cause an increase in graininess. The Simmon Negative Dryer consists of a tall chimney in which the film is suspended and at the base of which is a combined electric heating element and fan which enables films to be rapidly dried with complete safety. The same firm also makes a most compact enlarger for miniature negatives which folds into a cabinet. The same cabinet serves as the support and baseboard of the enlarger when in use and also embodies a safelight and timing switch. A masking board, on which is a focussing magnifier, is in the base. The lamphouse has special cooling arrangements and the specially designed negative carrier is free from glass and so eliminates dust and the possibility of scratches. Full particulars and prices will be supplied on application.

PHOTOGRAPHIC NEGATIVE DYE.

(Made by Johnson and Sons Ltd., Hendon Way, Hendon, London, N.W.)

This negative dye is in the form of a liquid of an intense black colour. It is a new preparation marketed by Messrs. Johnson & Sons, Ltd., the excellence of whose products is universally appreciated. The dye is very easily applied to negatives requiring treatment by means of a soft brush and it is best to dilute the concentrated solution before use. In order to build up the required density, several applications of the liquid should be made rather than trying to use the strong liquid in one application. If it should be necessary to remove the dye, this can be done simply by soaking the negative in water. This negative dye should be of considerable use to all photographers for retouching and building up density where required. The price is 1s. 6d. per bottle.

THE AUTOMATIC PRAXIDOS ENLARGER.

(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 2.)

An improved model is now being made of the Automatic Praxidos enlarger which was reviewed last year. For users of miniature cameras, such as the Leica and Contax, this enlarger is of particular interest since models are available which can be used with the standard 5 cm. lenses of those cameras. When ordering it must be stated whether the screw or bayonet fitting is required. Focussing is carried out by means of a cam fixed to the column and the enlarging head can be raised and lowered by means of a one-hand grip. There is special provision for adjusting the focussing cam exactly to suit the focal length of the lens to be used and thus ensure accuracy of focus. Various types of illumination are possible and are mutually interchangeable; either fully diffused, diffused with condenser or straight condenser illumination may be provided. A special negative holder ensures that the films are not scratched but are nevertheless held flat. The largest negative which may be used in this enlarger is 4 × 4 cm.

MERITOL AND SUPER FINE GRAIN DEVELOPER.

(Made by Johnson & Sons, Ltd., Hendon Way, Hendon, London, N.W. 4.)

By introducing this new developing agent, Meritol, Messrs. Johnson are to be congratulated on producing a substance of British origin which has all the good properties of para-phenylene-diamine without its attendant disadvantages. Meritol is sold in two forms; it may be obtained as a simple chemical by itself, or as one of the ingredients of Johnson's Super Fine Grain Developer. In either case the results are equally good, if the instructions are adhered to. Our own tests show that Meritol is capable of giving negatives of exceedingly fine grain on films of the super-speed variety. As with paraphenylene-diamine-glycin formulæ, it is necessary to give a certain amount of extra exposure, but this is only in the neighbourhood of a 25 per cent. increase over that necessary for the same film when developed in a fine grain developer of the normal type. The resulting negatives are not of the "ghost" type so frequently associated with super fine grain development, they are slightly brownish to look at but have good printing quality. To enable users to get the best out of this developer, even the first time, there is supplied a time and temperature table which lists all the films on the English market available for use in miniature cameras. Tests indicate that these development times can be relied upon, but slight variations must be made by users to make allowance for the different densities and contrasts of negatives to suit various types of enlarger illumination and to cater for varying personal taste. Meritol has the additional properties of being non-staining and non-poisonous, both of which properties are of advantage when in the hands of users not experienced in chemical matters. The price of Johnson's Meritol in the form of the separate chemical is 4s. 6d. per 1 oz. bottle and in the form of Super Fine Grain Developer it costs 2s. per tin to make 20 ozs. of solution; other sizes are available.

HALIE ACCESSORIES FOR PRINTING AND ENLARGING.

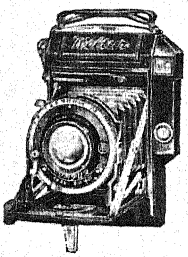
(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 2.)

By means of these Halie printing accessories, it is possible for the amateur to obtain various novel effects either by direct contact printing or enlarging. These special effects are produced by means of celluloid foils or screens which are laid on the surface of the paper during printing and the appearance of soft-focus, black and white engravings, oil paintings and even a linen-like texture can be imitated by this means. A novel negative retouching and print spotting outfit is also made by this firm; in addition to matt colours it contains colours for spotting glossy prints. There is also a transparent red colour included which is meant for control of thin parts of the negative; white colour is also provided for spotting prints. By using a special masking material, it is possible to print titles on to the margins of photographs direct and eliminate the necessity of writing on the negative. Masking material of various sizes is provided, both ready cut and uncut, and on it the title required is written by means of a pointed stylo.

THE WELTUR CAMERA.

(Sold by Peeling & Van Neck, Ltd., 4-6, Holborn Circus, London, E.C. 1.)

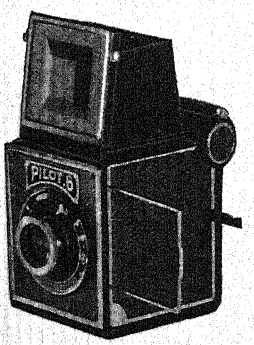
An amazing number of refinements are incorporated into this camera and it is a matter for congratulation that it can be done at the price. Standard $3\frac{1}{4} \times 2\frac{1}{4}$ ins. roll films are used but the camera is permanently arranged so as to take 16 pictures of half this size. The shutter is of either the Compur-Rapid or normal type and various lenses are available. The front is self-erecting at the touch of a button but the focussing is by means of a built-in rangefinder, the eyepiece of which simultaneously shows the field of view. By turning the focussing knob on the lens-board the camera front moves, the rangefinder is operated and an ingenious rotating distance scale works on the baseboard. The rangefinder is of the coincidence type, it shows the picture field coloured yellow with the clear rangefinder image in the middle. Focussing is thus easy and accurate. A depth of focus table is provided on the rangefinder housing. In addition to the ordinary instructions, a booklet of 127 pp. is given packed with good photographic advice, called "Camera-craft with your Welta." The price of this camera, with $f/2{\cdot}9$ Radionar in Compur-Rapid is £19 6s. 0d.



THE PILOT 6 CAMERA.

(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 2.)

The Pilot 6 is a useful little reflex camera which takes pictures $2\frac{1}{4}$ ins. square on roll film which is specially numbered down the middle for such cameras as this. By virtue of a unique shutter, it is possible to bring the mirror into position and reset the shutter in less than a quarter turn of a small lever at the side of the camera. There are three speeds to this shutter which can best be described as of the flap type, since it works in an arc between the lens and the film. It is made entirely of metal and gives 1/25, 1/50 and 1/100 and also B. & T. The release is made by either the downward pressure of a button or a wire release and its movement is remarkably free from vibration. Focussing is done by turning the front lens cell which is graduated and a magnifier is fitted to the focussing hood. The special films necessary are one of the standard products of both Ilford, Ltd., and Messrs. Perutz.

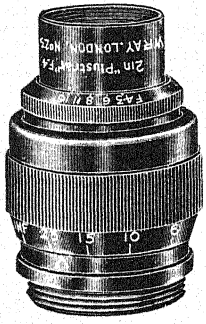


CINE REQUISITES.

PLUSTRAR TELEPHOTO LENS FOR SUB-STANDARD CINE CAMERAS.

(Made by Wray, Ltd., Ashgrove Road, Bromley, Kent.)

As a consequence of the favourable reception of the Plustrar Telephoto lens of aperture $f/4{\cdot}5$ introduced and reviewed in these pages last year, a further addition has been made to the series in the form of a two inch telephoto of aperture $f/3{\cdot}5$. This lens is intended for use on 16 mm. cine cameras but may also be adapted for use on the 9·5 mm. Dekko camera. It is fitted with a focussing mount which works very smoothly and is scaled in bold figures from 4 ft. to infinity. The diaphragm too works sweetly and is provided with a readily legible scale of aperture numbers. When adjusting the aperture, although both scale movements are very smooth, it does not happen that the focussing setting is altered as a result of stiffness in working. The lens is well hooded since it is fitted with a built-on, deep hood. Listed at a price of £4 10s. 0d., which includes a substantial leather case, this lens represents very good value for money.



THE SIEMENS MODEL "C" 8 mm. CAMERA.

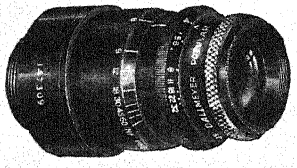
(Sold by Cinepro, Ltd., 1, New Burlington Street, London, W. 1.)

At first glance, this camera appears little different from the well-known 16 mm. ones supplied by this company. It is not until the deeply recessed and tiny lens is seen that the difference becomes startlingly obvious. Most of the advantages of the 16 mm. apparatus are retained in this miniature gem; one of the most prominent, perhaps, being the speed control coupled with the diaphragm adjustment. The lens is an $f/2{\cdot}5$ Busch-Glaukar Anastigmat of 13 millimetres focal length, and is contained in a focussing mount. The most novel point about this camera is really an accessory to it, i.e. the charger system which employs the ordinary double-eight spooled film. The charger can be loaded into the camera in daylight, and after that may be removed from the camera, in order to substitute a different type of film, without wasting or spoiling what has already been shot. One outstanding feature is that after one half of the film has been run through the camera, the motor is automatically switched off, and thus reminds the operator to change the charger round so that the other half of the film may be exposed, for which purpose it is not necessary to open the charger. These chargers will be available and sold quite separately from the camera, the price of which latter, including one charger, will be £37 10s. 0d. The chargers alone will probably cost something in the neighbourhood of 10s.

LENSES FOR 8 mm. CAMERAS.

(Made by Messrs. Dallmeyer, Ltd., 31, Mortimer Street, London, W. 1.)

If at any time the 8 mm. camera owner considered himself less fortunate than those who owned cameras of larger gauges, he need do so no longer, for this company have introduced yet three more lenses which will fit such cameras as the Filmo-8, the Keystone-8, etc. The first on the list is a 13 mm. anastigmat with an aperture of $f/1{\cdot}9$, and thus caters for every type of work which the amateur is likely to undertake, either indoors or outdoors. The advantage of such a large aperture is only appreciated to the full by those who have only had one chance to take some desired shot and then under the worst conditions. The next two lenses are both telephotos, with the enormous focal length of 1½ ins. ! When it is realised that this focal length constitutes a telephoto lens, some idea may be gained of the precision required in manufacture. With an aperture of $f/4$, the cost is £4 4s. 0d., and an aperture of $f/1{\cdot}9$ the cost is £8 0s. 0d., and the 13 mm. normal lens costs £8 8s. 0d.



MAGAZINE CINE-KODAK 16 mm. CAMERA.

(Sold by Kodak, Ltd., Kingsway, London, W.C. 2.)

This amazingly small, compact, new Kodak camera should appeal to those to whom amateur movie-making is rather frightening. Designed along lines conforming with the Kodak policy of doing all the work and leaving nothing to the possible mistakes of the user, this camera is really ' fool-proof.' It just will not work unless you follow the extremely simple directions. The magazine is of particular interest, as it is interlocked with the device which controls the locking mechanism of the camera door. When the tab is moved along to unlock this door, it operates at the same time a thin spring metal cover slide which effectively closes the magazine against the entry of light, and the door of the camera cannot be opened until this is done. By this means it is possible to change from one type of film to another without wasting a single inch of film in the process, and without any chance of what has been exposed being spoilt in the process of doing so. There are no two ways for either loading the camera or exposing the film. Even incorrect aperture setting —a difficult thing with the built-in exposure guide—is compensated to a great extent by the latitude and corrections applied to the stock in processing. It certainly bears out the maker's contention that

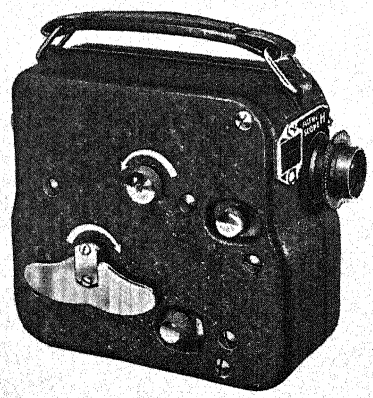


it has been designed afresh without reference to their previous products. Interchangeable lens mounting is provided and the viewfinder compensation for different lenses is simplicity itself. It is possible to change to any of three kinds of film loaded for this camera, normal panchromatic, super-sensitive panchromatic or Kodachrome, without wasting a single frame, and in a space of about 10 seconds. Footage indicators are provided on each individual magazine. The camera with a standard 1 in. $f/1{\cdot}9$ anastigmat costs £40. In addition 2 ins., 3 ins., $4\frac{1}{2}$ ins. and 6 ins. telephoto lenses may also be used on it. The overall dimensions of the camera are, length $6\frac{1}{4}$ ins., width 2 ins. and height $4\frac{3}{4}$ ins.—small enough to slip into an ordinary coat pocket.

THE PATHESCOPE MODEL "H" CAMERA.

(Sold by Pathescope, Ltd., North Circular Road, London, N.W.)

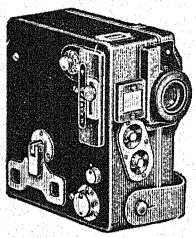
This, the latest camera to be produced by this firm, is the smallest edition of their 9·5 mm. apparatus that has yet appeared, and even on this score alone commands attention as an extremely ingenious piece of design and craftsmanship. It has been stated that this camera is the smallest 9·5 mm. one yet to be made at all. While, when one considers its price, it must of necessity be a simple camera, it does not sacrifice the more usual requirements for ordinary cinematography due to this simplicity in construction. The finish is extremely good and the motor is one of the smoothest running of many we have heard at anywhere near the price—it will expose about 15 ft. or so of film at one winding. Loading is very easy, and the instruction booklet supplied with the camera is concise and explains the working of the instrument in a thoroughly straightforward manner. At a price of £6 6s. 0d., with a fixed focus lens of aperture $f/2{\cdot}5$, made by the National Optical Co., Leicester, it represents good value for money. Two types of film are available, the normal orthochromatic reversal stock, and the fine-grain fast panchromatic reversal stock, both loaded into the specially small new charger which has been designed to match this camera. In making the necessary amendments to this charger, particular care has been devoted to the free running of the film from the top section and then into the take-up section of the charger. The film is sold in these chargers inclusive of processing costs.



THE DITMAR CINE CAMERA, 9·5 AND 8 mm.

(Sold by Actina, Ltd., 29, Red Lion Square, London, W.C. 1.)

This is an extremely compact piece of mechanism and little has been spared to make it as efficient as possible. There are numerous refinements which will appeal to the practical cinematographer including a new form of adjustment for the diaphragm, aperture and footage indicators visible above the view in the finder lens, variable speeds with two control knobs, no vertical parallax and full compensation for horizontal parallax. The gate pressure-pad can be swung fully open for inspection and cleaning. The charger is of special interest as the unexposed and exposed film chambers are separate entities with their own hinged lids. The film guides are of special section and also removable for cleaning. The 9·5 mm. models are available with the following lens equipments and at prices which are very reasonable in view of the many advantages offered. With an *f*/2·9 Cassar the camera costs £12 12s. 0d., and with an *f*/1·8 Berthiot £16 16s. 0d. The chargers cost 6s. 6d. each. The 8 mm. models also are available with two lens equipments, an *f*/2·5 Berthiot at £14 14s. 0d. and an *f*/1·8 at £16 16s. 0d. Additional lenses are available for both cameras in both 9·5 and 8 mm. sizes. Telephoto lenses are as follows :—Telephoto 2 Berthiot *f*/2·9 at £4 10s. 0d., Telephoto 2 Berthiot *f*/1·8 at £7 7s. 0d., Telephoto 3 Berthiot *f*/2·9 at £7 7s. 0d. ; and a wide-angle Berthiot *f*/2·9 at £7 7s. 0d. Portrait attachments for the fixed-focus lenses and filters are also available to fit all lenses.



THE "PEERLESS" SYSTEM OF FILM PRESERVATION.

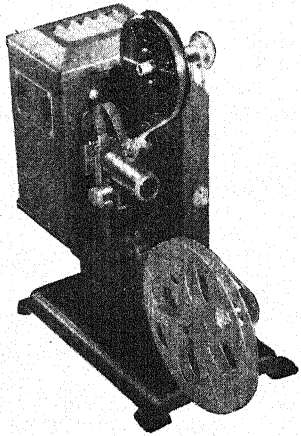
(All enquiries to the Westminster Photographic Exchange, Ltd., 24, Charing Cross Road, London, W.C. 2.)

In this system of film preservation, the film, still on its original spool as received, is placed into a vacuum cylinder, and a vapourised liquid of patented composition is forced into the film under pressure. This liquid permeates the entire film, whereupon a second liquid is introduced which sinks into the emulsion. This renders it virtually scratch-proof, impervious to injury from all atmospheric conditions, heat, dampness, oil or water. The system is stated to be perfectly safe, and is not likely to spoil any film, as the image is not discoloured nor are its projection qualities impaired. The film is not touched by hand at any stage of the proceedings, and the whole process is automatic. It is estimated that the life of the film is increased by 5 times with this method of treatment. The system is used professionally both in this country and in America. Charges are as follows :—400 ft. of either 16 mm. or 9·5 mm., or two 200 ft. spools of 8 mm. costs 5s. to treat, while 200 ft. of any of the above gauges cost 2s. 6d. ; 100 ft. of 16 mm., 1s. 3d ; 60 ft. of 9·5 mm., 1s. ; 50 ft. of 16 mm., 9d. ; 30 ft. of 9·5 mm., 6d. ; all roll films, 6d., and miniature camera strips such as Leica or Contax 9d each.

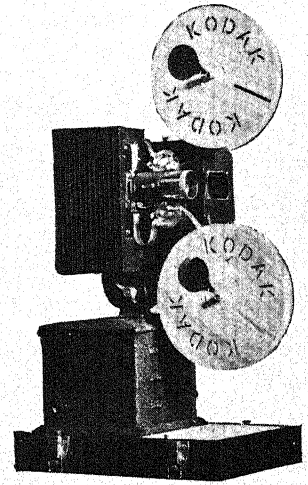
NEW KODASCOPE PROJECTORS.

(Sold by Kodak, Ltd., Kingsway, London, W.C. 2.)

The New Kodascope projectors occur in both the 8 mm. and the 16 mm. ranges. In the " Eight Model 35 " a modification has been made so that it can now be fitted with a 200 watt lamp instead of the old 100 watt lamp, and the price has only been increased by a guinea to £10 10s. 0d. For those who wish to show a brilliantly illuminated picture in an average sized room this machine should make especial appeal. At a distance of 14½ ft. the picture size, with the standard 1 in. lens fitted, is 30 × 22 ins. By means of simple interchangeable plug-in resistances, numerous variations in voltage are catered for—and therefore it is a simple matter, if it is necessary to take the machine from one place to another, to carry one of these small extra resistances, to cope with the variations in voltage found even in the same town in this country.



For those who have alternating current available, provided it falls within either of the two voltage ranges of 100-110 volts or 200-250 volts, the new Kodascope 16 mm. Model E has been designed. It incorporates a transformer in the pedestal of the machine, the whole standing on a vibration proof base, which latter in turn forms part of the carrying case—therefore, there are no loose sections to be mislaid or left at home when one goes out on an outside show. In view of the advantages offered with this machine, the price of £30 may be considered low—this need cause no alarm, for the machine is of the same sturdy design as the rest of this series of projectors. A universal model, except in this case a resistance is used to cope with voltage variations, is also available at the same figure.

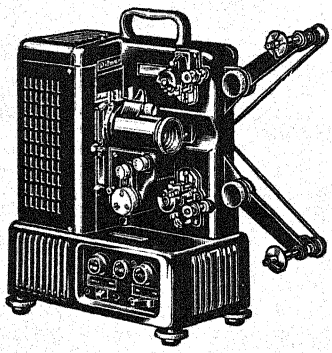


In addition to the standard 2 in. *f*/2·5 lens, there are five other lenses available for the Model E ranging in focus from 1 in. to 4 ins.

DITMAR DUO PROJECTOR.

(Sold by Actina, Ltd., 29, Red Lion Square, London, W.C. 1.)

This projector, which, as its name implies, is designed to take two gauges of sub-standard cine films and is made for the following pairs of film sizes 16 and 9·5 mm., 16 and 8 mm. and 9·5 and 8 mm.



In construction, the projector is virtually two projectors side by side with merely a common lamp, optical system and projection lens. The general shape of the instrument can be gathered from the illustration and it will suffice here to describe its special points. It is massively built but without being ugly, it conveys the impression of solidity which, indeed it possesses, since it gives a very steady picture. It is not heavy, despite its appearance. Thelamp-house contains an inner carrier which supports the lamp and condenser system ; this illuminating system is arranged so that it can be moved along to one side or the other so as to be behind one or other of the two gates which are side by side. The gate opens very wide and the film is placed in either of them according to the gauge in use. The remainder of the threading is then carried out over the appropriate sprockets, which are side by side, but both readily accessible top and bottom. The gate itself is easily removable by means of a spring catch and so can be cleaned effectively. The lens mount is arranged so as to swing on a pivot and has definite click stops directly opposite the appropriate gate opening. The mount itself is quite steady when in position and the focussing is smooth, so there is no risk of the picture going out of focus during projection. Further refinements include reversible spindles for holding both types of film spool. The lamp ammeter is illuminated and there are built-in pilot lights which have an independent fuse. This projector possesses many novel features well carried out and is very reasonably priced. Fitted with a 250 watt lamp and built-in motor resistance it costs £32 10s. 0d. ; with 500 watt lamp its price is £36 inclusive of resistance.

ROSCO PRODUCTS FOR CINEMATOGRAPHY.

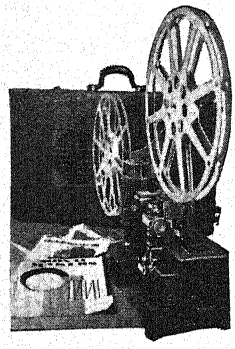
(Sold by G. H. Potts Ltd., 7-9, Baker Street, London, W. 1.)

A number of solutions for the use of amateur cinematographers are made by the Rosco Laboratories ; Filmrite is a film cleansing solution which helps to prolong the life of the film. Flexorine is a preserving fluid which is used on the pad of the storage can. A special lens cleaning fluid is also available by the same maker. For use in editing work there are two Rosco film cements, one for safety base and the other for nitrate film, each of which are specially compounded for their purpose.

THE 16mm. MODEL '138' FILMOSOUND PROJECTOR.

(Sold by the Bell & Howell Co., Ltd., 13-14, Great Castle Street, London, W. 1.)

This model of the famous Filmosound range of equipment has been developed primarily for the home-user. Actually there are two modifications of this machine available, the "A" which is fitted with a 500 watt lamp and may be used for either silent or sound films, costing £138, and the "B" which is fitted with a 750 watt lamp, but which will only run at sound speed, and costing the same money. The machine accommodates the new large 1,600 ft. reels, and a special snubber is incorporated to obviate film snatch due to the flywheel effect of these large spools. The projector and amplifier are in the form of a single unit, and the cover of the case serves as a baffle for the self-contained loud-speaker unit. The sound-head is of new design, and incorporates a rotating sound-drum, flywheel and floating idler. The voltages on the exciter-lamp and photocell are balanced automatically with changes on the volume control. The valves in the amplifier unit are of the new metal type, thus making for robustness in transit. A new form of tilt device is fitted, needing only one hand for operation ; motor rewind ; and a reel arm which can be attached quickly to the machine with only a single screw fitting. With the known standard of Bell-Howell quality, this machine can be confidently recommended to carry out its duties for long periods without any attention beyond that normally expected for maintenance.



KODACHROME TYPE "A"

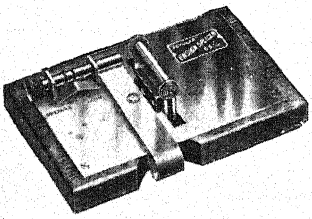
(Sold by Kodak, Ltd., Kingsway, London, W.C. 2.)

An announcement of considerable interest to those who wish to undertake the preparation of colour cine films on sub-standard stock by artificial lighting is that of the Kodak Co., who have prepared a special emulsion of Kodachrome for this purpose. Any form of artificial lighting may be used with this material—either normal or of the over-run type, such as Photofloods. Due to this fact it is now no longer necessary to use a filter for correction purposes, and therefore its apparent speed is much higher than would be the case with the older type Kodachrome film with a blue filter. It is stated that good close-ups may be obtained with three or four Photofloods in reflectors—i.e. an equivalent wattage of approximately 2,000 to 3,000. Careful note should be made of the fact that this modification of Kodachrome will not give correct colour rendering in daylight, arc lamps or blue-bulbs. It can be corrected back, as it were, to normal Kodachrome by the addition of a special filter. The prices are the same as those for normal Kodachrome, i.e. 50 ft. for £1 2s. 6d. and 100 ft. for £2 2s. 0d.

THE ENSIGN "POPULAR" FILM SPLICER.

(Sold by Ensign, Ltd., 88-89, High Holborn, London, W.C. 1.)

This model of the Ensign range of film splicers is rather simpler in form than the previously introduced "Universal" model. It is, however, very well made and good value for money, and will do its job with the minimum of fuss and trouble. There are three separate models, one for each of the sizes, 16 mm., 9·5 mm., and 8 mm. They are all fitted with an accurately ground and hardened steel scraper, film shearing lever and pressure pad. The whole thing is dull nickel plated and mounted on a hardwood base with rubber feet —it should be noted, however, that two holes are also provided in the base, so that it may be plugged on to the companion piece of apparatus, the "Popular" Film Editor. The cost of each of these three models is 17s. 6d. each, and includes a 1 oz. bottle of Ensign universal film cement.



MOVIKON 8 mm. CAMERA.

(Sold by Zeiss Ikon Ltd., Mortimer House, Mortimer Street, London, W.1.)

The 16 mm. Movikon reviewed last year in these pages was perhaps one of the nicest pieces of precision mechanism in the sub-standard cine field that had been produced. To add to their laurels, Messrs. Zeiss Ikon have now produced this miniature version of a camera that was already as compact as it was possible to imagine such a complicated piece of apparatus could be. That the dimensions could be reduced in order to produce a camera for the 8 mm. user is amazing. When one examines the number of refinements incorporated, superlatives become redundant. The motor is exceedingly quiet in operation and may be run at any one of three speeds, 8, 16 and 64 pictures a second. It may be started in the usual way with the press button, or by means of a built-in delayed action release which can also be made to give a visible warning in addition. Both continuous running and single-picture exposures for stop-motion may be used. The lens fitted is 1 cm. focal length, and of the Sonnar $f/2$ series, but fixed focus. It is interchangeable against a long focus (2 cm.) Tessar $f/2{\cdot}7$ with the well-known bayonet catch system. The really novel point about this instrument, for instrument it truly is, is the fact that both double-run 8 mm. film or single-run 8 mm. film may be used. The necessary alteration from one size to the other can be made in a few seconds without the use of any tools or supplementary devices. There are one or two further points of interest. On looking through the viewfinder there is a tell-tale which shows whether or not there is film in the gate. There is also a scale visible over which a pointer travels to show the state of the motor spring, and the scale shows how much more film the motor is capable of transporting. The gate is very easy to load. An easily accessible lever opens the gate and withdraws the transport

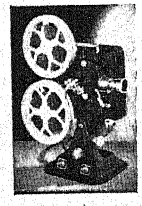
sprocket for loading; after inserting the film the gate is closed and the sprocket re-engaged in the film by returning the lever. The viewfinder is of the usual direct vision type but by means of an external button a reflecting prism may be swung into the path of the rays, and it works as an angular viewfinder. A clip is also provided for the use of a reflecting finder for low viewpoints. In addition to the footage indicator, a similar meter, scaled in red, shows the motor tension in the same way as the viewfinder scale. The price of this excellent little camera is £48 17s. 6d., including one take-up spool.

KEYSTONE SUB-STANDARD CINE APPARATUS.

(Sold by R. E. Schneider, 46, Farringdon Street, London, E.C. 4.)

The whole of the apparatus to be mentioned comes into the moderately priced class, but nevertheless simplicity is the keynote rather than cheapness in production. The cameras, both 16 mm. and 8 mm. are sturdy instruments of careful design. At the prices quoted it is amazing that a register pin or pilot pin can be incorporated in the film transport mechanism. This assurance of steadiness of the picture is a feature rarely found even on expensive cameras. The literature accompanying each outfit leaves little doubt as to the correct procedure to be adopted in using it. The 16 mm. A-3 model, with interchangeable lens mounting, three speeds and an $f/3{\cdot}5$ lens costs £13 13s. 0d., while the 8 mm. " 8 " camera, with a similar specification, costs £10 10s. 0d. Numerous accessories such as telephoto lenses are ready for both cameras.





What has been said of the cameras applies equally well to the projectors in both gauges. In particular, mention should be made of the 16 mm. 300 watt model at £18 18s. 0d., which figure includes a resistance, splicing outfit, reel and other sundries. The electrical equipment is of a high standard and ensures safety in working. The " 8 " projector has a 200 watt lamp, ample for all home uses, and the general finish and appearance leaves little to be desired. If one wanted to be exceedingly critical, it is felt that the manual framing lever might be better designed in view of the small amount of shift required on this small gauge film. The lens mounting is very pleasantly rigid. The cost of this model is £13 13s. 0d. although the resistance is £1 19s. 6d. extra.

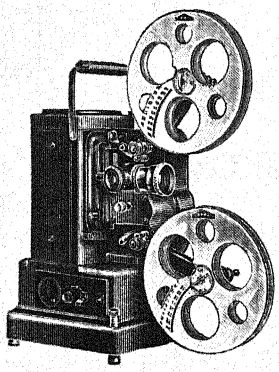


For those who do their own editing and splicing the No. 745 illuminated editor, complete with geared rewinds, viewer with focussing magnifier and splicer for both 16 mm. and 8 mm. should prove of interest at £2 19s. 6d. It is soundly constructed and quite efficient in working. The lamp is a special one which connects direct to the mains. A bottle of film cement and one for water even are included.

PAILLARD-BOLEX G-916 "HOME" MODEL PROJECTOR.

(Sold by Cinex, Limited, 70, High Holborn, London, W.C. 1.)

This modification of the original 500 watt G-916 projector has a new shutter mechanism which is equivalent to a four-bladed shutter. It is actually a two-blade shutter which rotates at twice the film speed, thus giving a four-blade effect. This means that it is possible to project films at the extraordinarily low speed of 12 pictures a second without any trace of flicker, and use to the best advantage the 500 watts of illumination available; for it will be realised that with the normal three-bladed shutter there is very often more light available than is normally required in the home with a screen of less width than 8 ft. The original model, with the three-bladed shutter, is still marketed, except that it will be known as the G-916 "Industrial" and is intended for use in large halls, etc. The new interlocking on the motor and light switching is an extremely interesting feature and should do much to conserve the life of films projected in this machine and avoid blistering. It is now impossible to switch on the lamp before the motor or to switch off the motor with the lamp still alight. Improvements have also been made to the gate, which is now centre sprung, instead of the side pressure previously adopted. The resistance control for the motor speed has been amended, giving a shorter travel and permitting the machine to be run at speeds up to 36 pictures per second.



AMATEUR CINE ACCESSORIES.

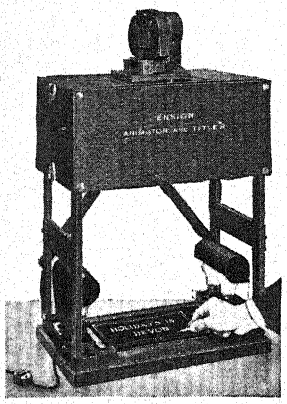
(Sold by Amateur Cine Service, Ltd., 52, Widmore Road, Bromley, Kent.)

A useful accessory for titling, known as the Wipacine Titling Accessory, enables wipes to be made at any angle, without using masks or winding back. The size of the opening is 9 × 6¾ ins., and titles, stills or actual enlargements from film frames may be used. Price complete 30s. For producing fades on all makes and sizes of processed cine film, a dye known as Fadeine, into which the film is dipped, is supplied by this firm. Other useful and practical accessories include an adhesive film, obtainable either black or transparent in 16 mm. size, for wipes, editing and film repairs. Price 5s. per 33 ft. roll. Amacine transformers, for use on A.C. mains with all makes of cine projectors, are obtainable at prices ranging from 35s. to 90s., according to the wattage, and special models can be constructed. A useful titling set has just been introduced; it has adhesive celluloid letters, and, complete with three backgrounds costs 35s.

THE ENSIGN ANIMATOR AND TITLER.

(Sold by Ensign, Ltd., 88-89, High Holborn, London, W.C. 1.)

This particular piece of apparatus appears to have been designed by a practical cinematographer, who, realising that the average amateur cannot find room for a permanently erected piece of apparatus such as this, has made the whole thing to fold into a compact carrying-case for transit or storage. It is of the vertical type; a form which is probably the best for animation work where the greatest ease in working is desired. The size of the title background is 10 × 7½ ins.—a size that will appeal to those who have to make drawings for diagram work. The photographic area is illuminated with four lamps, which are set out sufficiently far to eliminate any unnecessary reflections from them when using a glass cover-plate on the background, or celluloid overlays. At the top of the equipment there is provided an aperture into which can be fitted interchangeable aperture plates which can be fitted to accommodate most cameras. Various accessories are provided, and pack into a neat detachable case. These include a complete set of white felt letters, both capitals and lower case, reversible black and white flock linen title background, cover glass, tweezers and set-square. Price complete, but not including lamps, is £6 17s. 6d.



ZEISS KIPRONAR CINE PROJECTION LENS.

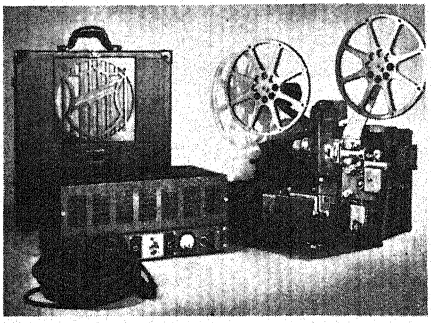
(Sold by Carl Zeiss (London), Ltd., Mortimer House, Mortimer Street, London, W. 1.)

A new series of extra wide aperture projection lenses for standard size cine equipment is available under the name of Kipronar. All focal lengths have the aperture of $f/1{\cdot}9$ and so are capable of giving an image of extreme brilliance on the screen; thus they are suitable for use in the biggest of cinemas which have a throw of extreme length and require a projection lens of correspondingly long focus. Optically, these lenses are a modification of the Petzval construction, but have been considerably improved in the matter of spherical correction. Colour correction too has received special attention. Since the optical system consists only of two cemented doublets, losses by internal reflection are reduced and so about 10 per cent. more light transmission is obtained for the same aperture and focal length. The lens surfaces are easily cleaned, both inside and out since both lenses unscrew easily from the mount. Prices vary according to focal length; a Kipronar of 9 cm. focus costs £7 11s. 0d. whilst one of 20 cm. focus is £59 12s. 0d.

1,000 WATT FILMOSOUND PROJECTOR.

(Sold by Bell & Howell Co., Ltd., 13-14, Great Castle Street, London, W.1.)

This latest projector might well be termed the senior member of the family (although not in age !). An examination in detail of the component parts of this equipment will satisfy even the most critical person that the claims put forward for it are in every way justified. The lay-out differs from previous Filmosound machines, in that the projector, amplifier and speaker are entirely separate units, making it possible to use the amplifier as a separate unit for public address work, without having also to take the projector. Furthermore, it is possible to add a second projector for theatre type installations without the necessity of duplicating the amplifying equipment. The principle parts of the outfit are aluminium die-castings—chosen because of their lightness and strength, and for the ease with which accurate spares may be supplied. It will be obvious that much time has been spent on the design of the lamp-house, when the amount of heat which accompanies the use of a 1,000 watt lamp is considered. It is possible to change the lamp expeditiously, and naturally pre-focussing is provided.



The optical system is of the direct illumination type, and thus the maximum efficiency is secured. The various parts are easily accessible for cleaning; an important point in maintaining the efficiency of the machine. The focussing, with its two speed control, permits of easy, rapid and yet accurate adjustment. Spools varying in capacity from 400 to 1,600 feet can be accommodated by means of a variable speed control on the take-up motor. The main projector motor is governed by an internal mechanism which deals with fluctuations in the mains voltage. In order to ensure that this high-power lamp will have the maximum possible life, an accurate voltmeter in conjunction with a cooled rheostat, makes it possible to adjust the voltage impressed upon it. With fan cooling, gear drive throughout, the humidifying blast upon the film after it has passed through the heat of the gate, and many other refinements which one would not expect to find upon sub-standard equipment, this machine takes its place in the front rank. Thus, it will be seen to be a machine for the experienced sub-standard worker who places quality above all other considerations. The complete equipment is undoubtedly worth the £300 charged for it.

LAACK LENSES.

(Made by Julius Laack Söhne, Rathenow, 53, Germany.)

The latest developments of the Laack Optical Works are principally of interest to cine workers; they are able to announce a special series of lenses for use on 8 mm. cine film. There are now two new standard lenses available, the Cine-Polyxentar of aperture $f/1{\cdot}3$ and focus 12·5 mm. and also the Pololyt of the same focal length but aperture $f/2{\cdot}8$. The former lens, on account of its small dimensions and working distance is truly a masterpiece of precision construction. Both give excellent definition and are intended for use on the well-known Cine-Nizo 8 mm. cameras. In addition, there is a whole series of long focus lenses of apertures ranging from $f/2{\cdot}7$ to $f/4{\cdot}5$ of the well known asymmetrical triplet construction. These are intended for 8, 9·5 or 16 mm. sub-standard cine film work. For long distance photography, this firm have now introduced a red filter of all-glass construction and with optically finished faces. For artificial light photographs, a similar blue filter is obtainable. As a result of considerable experiment and research a series of high aperture projection lenses for 16 mm. projectors has been designed. These are called the Heleston series and are of apertures of $f/1{\cdot}6$ and $f/1{\cdot}8$ of focal length 3·5 and 4·5 cm. focus. This series will shortly be extended to provide lenses of suitable focus for 8 mm. projectors.

WESTEX PROJECTOR REELS.

(Sold by the Westminster Photographic Exchange, 24, Charing Cross Rd., London, W.C.2.)

These reels are all pressed from aluminium, with well perforated sides, making both for lightness and for ease in threading. The centre core is well riveted, and is of such design that in both the 16 mm., and 9·5 mm. sizes, a full 400 ft. of film can easily be accommodated on the spool. All the reels are scaled to enable the total length of the film on the spool to be ascertained at a glance. Prices are as follows :—400 ft. 16 mm. spool, 2s. 6d., and can to fit, 1s. 3d., 3 spools for 6s. 9d.; 400 ft. 9 mm. spool, 2s., and can to fit, 1s. 3d., 3 spools for 5s. 9d.

THE ENSIGN "POPULAR" FILM EDITOR.

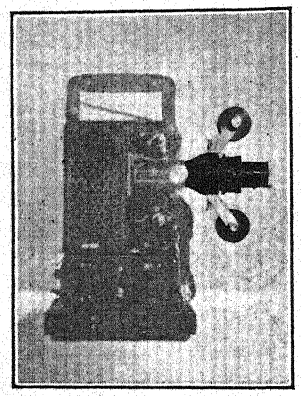
(Sold by Ensign, Ltd., 88-89, High Holborn, London, W.C. 1.)

This is another of the new lines which demonstrates the strides made by this firm in catering for all gauges of cine work. Three variations of this model are available, covering 16 mm., 9·5 mm., and 8 mm., and in each case the outfit consists of a wooden base, upon which are mounted a pair of geared (ratio 3 to 1) rewind arms. To complete the outfit all that is required is a "Popular" model splicer of the appropriate gauge, which is simply plugged onto the baseboard. As an illustration of the care which has been put into the design, the rounded ends of the baseboard are interesting—this helps to prevent film scratching, of course. Any of the three models costs 25s., so that with the addition of a splicer at 17s. 6d., the whole outfit can be obtained for £2 2s. 6d., which is exceedingly reasonable.

THE FILM SLIDE ADAPTOR.

(Sold by Cinepro, Ltd., 1, New Burlington Street, London, W. 1.)

For those who use a miniature camera, and make either positive transparencies or the small contact printed glass 2 × 2 ins. lantern slides, this adaptor will be of interest; for often a miniature camera user is also a sub-standard film enthusiast. The normal projection lens of the Siemens standard 16 mm. projector is removed from its mount and the film-slide-adaptor placed therein, the lens then being transferred to the front of the adaptor. In this way, transparencies may be projected with the standard cine machine. The bobbins supplied with the adaptor will hold up to 100 ft. of 35 mm. film, and thus allow a large number of slides to be projected one after the other with very little difficulty or trouble. With the protective devices incorporated, it is possible to project a 'still' indefinitely, without any danger of blistering by heat—this is an important point, particularly in the case of colour transparencies on the reversal system, which are not replaceable in the ordinary way. The film is held flat by means of a spring glass pressure plate which may be removed and exchanged for a slide gate when 2 × 2 ins. glass slides are to be projected. The image is of surprising brilliance, due to the special supplementary condenser incorporated. The cost of this adaptor, together with the twin slide holder is £7 15s. 0d., and should one's present projection lens not be suitable for the particular throw in mind, then other lenses of longer focus may be obtained to suit.



ENSIGN PROJECTOR REELS AND HUMITINS.

(Sold by Ensign, Ltd., 88-89, High Holborn, London, W.C. 1.)

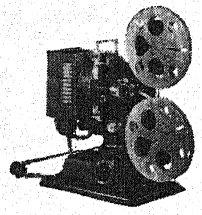
These two companion accessories are alike in their excellent finish and usefulness. In particular, attention is drawn to the novel way of holding the film on to the core of the projector spools, and the ease in fixing. These spools are made of aluminium and are marked with footage indications. The humitins are strong and cleanly finished—their strength comes from the careful embossing. This finish also ensures that the tins are efficiently tight, and also that the lids will come off easily when required. The contents of each tin can be easily indicated on the white title strip provided on the edge of the lid. The absorbant pad contained within the tin is used for keeping the film moist and flexible and may either be damped or moistened with one of the special solutions now on the market. Prices are as follows, and have been grouped in the

respective sizes and gauges. 400 ft. 16 mm. spool, 3s. 6d. and humitin to fit, 1s. 6d. ; 400 ft. 9 mm. spool, 3s. 6d. and humitin to fit, 1s. 6d. ; 200 ft. 16 mm. spool, 2s. 6d. and humitin to fit, 1s. 6d. ; 200 ft. 9 mm. spool, 2s. 6d. and humitin to fit, 1s. 6d. ; 200 ft. 8 mm. spool, 2s. 6d. and humitin to fit, 1s. 6d.

NEW MODEL II VICTOR PROJECTOR.

(Sold by Dallmeyer, Ltd., 31, Mortimer Street, London, W. 1.)

With the addition of this machine to the deservedly famous range of Victor projectors, the choice of apparatus to fulfil any given set of conditions becomes easier. It is fitted with the well-known Max-lite lens and with a 500 watt lamp provides ample light for most occasions. The benefit of such a combination of reasonably high-powered light source and a wide aperture lens is most appreciated when it is necessary to project dense films to a fairly large audience. This machine will accommodate the large 1,600 ft. reels, thus obviating the necessity of changing spools so frequently. A constant-speed motor is fitted and is coupled to the rapid power rewind mechanism, enabling much time to be saved in this task. Although extremely compact, it remains of pleasing design, and the internal workings of the machine do not suffer in consequence—it should be noted that the lamp runs quite cool, thus tending to prolong its life. Considering its many advantages it cannot be rated as an expensive machine at a price of £42 0s. 0d.



12-VOLT ATTACHMENT FOR SIEMENS PROJECTORS.

(Sold by Cinepro, Ltd., 1, New Burlington Street, London, W. 1.)

For those who live in a country district, or who have to give shows in village halls, etc., far removed from a source of electrical energy, this 12 volt attachment should prove a boon. The attachment is a self-contained unit and does not interfere with the normal operation of the machine on ordinary mains. It consists of a cast alloy tray on which the machine rests—this may be either a Standard, Home, or Sixteen-Nine model. This tray carries the 12 volt motor, speed control and switches. Current may be supplied either by a separate 12 volt 60 ampere-hour car battery, or by a battery of similar voltage actually in a car—thus enabling charging to be done in the ordinary way by the car dynamo. The lamp for use with this attachment is a 12 volt 50 watt, with a very compact filament, and is provided with a focussing adjustment, thus enabling the maximum screen illumination to be realised—a special lamp-holder-adaptor is supplied enabling this to be inserted in place of the standard lamp fitted to the machines. Taking into consideration the high optical efficiency of the Siemens machines, it is claimed that an output equivalent to many 200 watt lamps is provided with this attachment. The whole equipment takes about 9 amperes from the battery—hence the suggestion that a 60 ampere-hour battery should be provided. The complete attachment costs £12 12s. 0d., and spare lamps can be supplied at 10s. 6d. each.

SIEMENS MODEL "H" 8 mm. PROJECTOR.

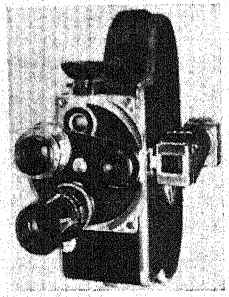
(Sold by Cinepro, Ltd., 1, New Burlington Street, London, W. 1.)

This projector forms the companion piece of apparatus to the new Model " C " camera for the same gauge of film. It is based, in design, on the popular 16 mm. Home projector, and combines many of the features of that machine in this smaller gauge. The whole of the mechanism and adjustments are easily get-at-able for cleaning and attention ; in particular, the swing-out gate should be noted ; this is a most useful feature when the question of possible accumulations of dirt are considered, and their harmful effects on the small images on this sized film. The machine is exceedingly quiet when running and the pictures projected are steady, and well illuminated, as one would expect from a firm that prides itself on the amount of light reaching the screen from any of its projectors. The price is £37 10s. 0d., the same as the camera, to which it is a fit companion.

PAILLARD-BOLEX H-9 AND H-16 CAMERAS

(Sold by Cinex, Ltd., 70, High Holborn, London, W.C. 1.)

In keeping with the tradition of this firm, several important improvements have been incorporated in these cameras, which were reviewed for the first time last year. Probably the most important is the provision of a critical visual focusser, consisting of a prism with a very finely ground surface. When it is realised how exact the focussing of a wide-aperture cine lens must be, the necessity for a really finely ground surface on the focussing device becomes obvious, otherwise the device is not only useless, but likely to lead the operator astray. The audible footage indicator may now be coupled in or not at will—this new departure will be appreciated by those who do not wish to draw attention to their camera. On those cameras fitted with Meyer lenses a new totally closing diaphragm is available, which should prove very useful when it is desired to make a complete black-out at the end of a fade out. There are slight alterations to the price of the cameras, as follows : With a Dallmeyer $f/2 \cdot 9$ the cost is £51, and with an $f/1 \cdot 5$ it is £55.



GEVAERT SUB STANDARD CINE FILMS WITH ANTI-HALATION BACKING.

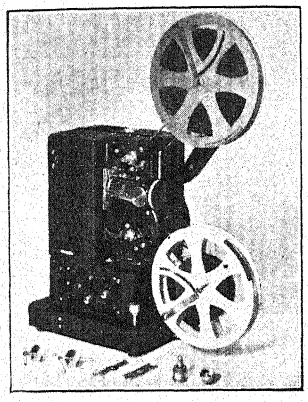
(Sold by Gevaert, Ltd., 115, Walmer Road, London, W. 10.)

A new introduction is being made by Messrs. Gevaert in all their sub standard reversal films by providing them with a black anti-halation backing. The films affected will be the Ortho Reversal, Panchro Normal Reversal and Panchro Super Reversal, whilst these films will be supplied in all three sizes, namely, 9·5, 8 and 16 mm.

THE SIEMENS SIXTEEN-NINE PROJECTOR.

(Sold by Cinepro, Ltd., 1, New Burlington Street, London, W. 1.)

This machine, as its name implies, is a dual purpose one, enabling either sixteen millimetre or nine-and-a-half millimetre to be shown at will, merely by the interchanging of the front and back of the gate assembly, spool spindles and sprockets. All of these changing operations can be carried out without the use of any tools. It should be noted that the familiar Siemens pull-down mechanism is still incorporated, ensuring that the minimum of wear takes place when projecting any film. An advance, is the provision of optical framing, ensuring that the picture stays still on the screen when framing takes place. Those who like to see the state of the gate, and to be able to keep it scrupulously clean, will be pleased to find that the front portion swings out and clear of the back portion and thus renders the entire film channel easy of access. The machine differs from many others, in that the supplementary voltage reducing resistance is part of the machine and quite self-contained ; it is also fan cooled and thus prevents the machine from becoming over-heated. In addition, of course, it tends to reduce both the weight and bulk of the whole outfit—a telling point for those who have to carry a machine from one place to another very often. The gate is also cooled by a fan, permitting the projection of ' still ' pictures for a considerable length of time. The shutter is of the interchangeable type, two and three bladed forms are provided. With all these advantages the machine sells at £59 10s. 0d.



CINEX FILM STRIP ATTACHMENT.

(Sold by Cinex, Ltd., 70, High Holborn, London, W.C. 1.)

This attachment is designed so as to be capable of being rapidly fixed to a Bolex projector and with it to show still pictures on standard 35 mm. cine film. The lens is removed from the projector and in its place is inserted the film strip attachment which has its own projection lens built in. The attachment simply consists of a supplementary condenser lens and a suitable gate for the film strip together with two spools for holding and transporting the film through the gate. It is further possible to use small glass slides in place of the film strip. Although, if required, the attachment is available with various focal length lenses, the standard is 5 ins. which gives a picture the same size as that given by the 2 ins. lens on the cine projector at the same screen distance. Complete with condenser, projection lens, spool holders and in a grey enamel finish to match the projector, the attachment costs £5 10s. 0d.



(All formulae have been revised for the present edition).

ORTHOCHROMATIC PROCESSES

Colour Sensitisers.

Sensitol Red and Sensitol Violet both sensitise strongly for red, orange and bright (yellowish) green. Sensitol Green sensitises strongly for the whole of the blue-green, yellow-green, and yellow, and well into the orange-red.

Plates treated with the red or violet dye may be handled by the light of a safe-lamp transmitting only bluish-green light between λ50 and λ52, but no other light is permissible. Plates treated with Sensitol Green may be handled by a deep ruby light.

A clean working plate, and in the case of Sensitol Violet a slow plate, such as Ilford Ordinary or Empress, should be selected for treatment in order to obtain sensitised plates free from veil.

Stock Solutions.

In making these it is preferable to dissolve the dye first in part of the solvent (heated), and then to dilute to the requisite strength. The Sensitol Red is made up to 1 : 1000 and the Sensitol Violet up to 1 : 5000 with alcohol or industrial spirit.

Sensitol Green is also made up to a strength of 1 : 1000, but a quarter of the solvent, in which the dye is first dissolved, should preferably be methyl alcohol or wood spirit, the remainder being ethyl alcohol or industrial spirit.

All these solutions keep indefinitely in the dark; there is, however, a tendency for Sensitol Red to crystallise out at low temperatures, in which case it should be re-dissolved by careful warming.

Bathing Process.

The actual sensitising baths may be obtained by diluting the stock solutions with water (red and green dyes only) or with spirit.

Aqueous Dye Bath.

Distilled water, 1,000 parts; stock dye solution, 15-20 parts.

Bathe for about 3 minutes, wash well in running water or frequent changes for several minutes, and then dry as quickly as possible in a current of warm dry air free from dust.

Alcohol Dye Bath.

	Red	*Green*	*Violet*	
W ...	500	500	500	parts
S ...	250	250	200	,,
D ...	10	15	50	,,

W is distilled water; S, industrial spirit; D, stock dye solution.

Bathe for about 3 minutes, and then dry, without washing, in a current of dry air; this must be cool in the case of the Sensitol violet dye.

All the above operations should be conducted in darkness or in a minimum of deep red light (in the case of Sensitol Green) or of bluish-green light (for Sensitol Red or Sensitol Violet).

The aqueous baths gradually deteriorate on keeping.

The alcoholic baths keep in good condition and may be renewed, after use or after long storage, by the addition of a little stock dye solution.

Safelights.

The following formulæ are for safelight screens made by coating glass with gelatine solution containing a dye. They are suitable for use with electric light, but the screens are liable to fade and become unsafe when used as filters of daylight.

Throughout, the gelatine is one of 6 per cent. strength (60 gms. dissolved in 1,000 c.c.s. water). Each dyed solution is applied in the proportion of 7 c.c.s. per 10 square inches of glass.

In coating, care must be taken to see that the glass sheets are quite level, otherwise the film of dyed gelatine will be of uneven thickness and might thus not be safe. Shallow troughs may be made of the glass sheets by means of a narrow border of putty or Plasticine in order to retain the gelatine solution whilst it is still fluid.

Each safelight is made by binding together two coloured gelatine-coated glasses film to film, with or without insertion of white tissue or other paper according as direct or diffused light is desired.

Bright Yellow.

For Lantern Plates or Gaslight Papers.

Gelatine solution ... 500 c.c.s.
Naphthol Orange ... 4 gms.
(dissolved in 100 c.c.s. water.)

Orange.

For Bromide Papers.

I.—Gelatine solution 100 c.c.s.
Tartrazine ... 0·8 gms.
II.—Gelatine solution 100 c.c.s.
Rose Bengal ... 0·3 gm.
(I. and II., bound film to film, form the safelight.)

Red.

For Ordinary and Yellow-Green Sensitive Plates.

Gelatine solution ... 500 c.c.s.
Dark-Room Red (Höchst) ... 4·5 gms.
(dissolved in 100 c.c.s. water.)

Green.

For Ordinary and Yellow-Green Sensitive Plates.

Gelatine solution ... 500 c.c.s.
Dark-Room Green (Höchst) ... 4 gms.
(dissolved in 100 c.c.s. water.)

Dark Red.

Relatively safe for Panchromatic Plates.

Gelatine solution ... 500 c.c.s.
Dark-Room Dark Red (Höchst) ... 4·5 gms.
(dissolved in 100 c.c.s. water.)

Dark Green.

For Panchromatic Plates.

Naphthol green	61 grs. (8 gms.)
Filter blue soln.	½ oz. (32 c.c.s.)
Gelatine (8%) ... solution	16 ozs. (1,000 c.c.s.)

The Filter Blue solution is prepared by dissolving 0·1 gm. (0·88 grs.) of filter blue in 1,000 c.c.s. (20 ozs.) of water, and adding 1 c.c. (10 minims) of ammonia. Of the mixed solution allow 7 c.c.s. per 100 sq. cm. (750 minims per 100 sq. ins.)

DESENSITISING.

Pheno-safranine.

Various safranine dyes may be used for desensitising before development. That which is mostly used is pheno-safranine. A stock solution may be prepared by dissolving 10 grains of the dye in 4½ ounces of water (1 gramme in 200 c.c.s.). For use, 1 part of this solution is added to 9 parts of water. The plate should be immersed in this solution for 2 minutes—a longer immersion will do no harm—and then rinsed and placed in the developer.

Ordinary and orthochromatic plates may be immersed in the desensitising solution by the ordinary darkroom lighting: panchromatic plates must be handled in darkness until after desensitising. Orthochromatic and rapid ordinary plates may be safely developed in a bright orange light or by subdued white light. Panchromatic plates still require care in regard to the use of a light for developing. The amount and character of the light used depends on the speed of the plate and the dye used for producing colour sensitiveness. With most a red safelight may be used, while with others a feeble white light is preferable. In any case the direct rays of the light should not be allowed to fall on the plate.

When a plate has been desensitised with pheno-safranine, a hydroquinone developer acts similarly to metol: metol-hydroquinone is almost unaffected: pyro soda and amidol are slightly restrained.

Pinacryptol Green.

Pinacryptol-green is a thoroughly efficient desensitiser for ordinary and colour-sensitive plates. Like pheno-safranine, pinacryptol - green energises hydroquinone, has less effect with either metol-hydroquinone or pyro; it exercises a decided restraining effect on amidol. An added advantage is that it does not stain the emulsion.

A stock solution may be prepared by dissolving 10 grains in 11½ ounces of warm water (1 gm. in 500 c.c.s.). This 1 in 500 solution is diluted for use by taking 1 part and adding 9 parts of water. The plates are immersed in this solution for 2 minutes, rinsed and placed in the developer. As described for using pheno-safranine the ordinary red safelight may be used when desensitising rapid ordinary and orthochromatic plates, but panchromatic plates must be kept in total darkness until desensitised.

Pinacryptol Yellow.

Used as a preliminary bath before development, pinacryptol-yellow is preferable to pinacryptol-green for desensitising colour plates and some colour sensitive plates, as it does not stain. Preparation is as for pinacryptol-yellow.

NEGATIVE DEVELOPERS.

Attention is directed to the note relating to developer poisoning which will be found on p. 334.

Weights and Measures.

In all formulæ the metric weights are not equivalents of the British item for item, but each formula gives a solution of the same composition.

One-Solution Developers.

We give the following one-solution developers for thosewho prefer this form, but generally speaking the two-solution form is preferable, as the solutions remain in good working condition for a longer time.

Metol.

Metol	75 grs. (17 gms.)
Sodium sulphite, cryst.	1¼ ozs. (125 gms.)
Sodium carbonate, cryst.	1¾ ozs. (175 gms.)
Potassium bromide	8 grs. (1·8 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

NOTE.—We cannot endorse the directions generally given that in preparing developing solutions containing METOL, the metol should be dissolved first in plain water. To prevent oxidation, a pinch of sulphite should first be dissolved in water at not more than 120° F. If the metol is added to this it will readily dissolve in safety, after which the remainder of the sulphite may be added and the other chemicals dissolved.

For use take stock solution, 1 part, water, 2 parts.

This developer tends to give soft and delicate negatives rather than contrast.

Hydroquinone.

Hydroquinone ...	50 grs. (11·5 gms)
Sodium sulphite cryst.	1 oz. (100 gms.)
Sodium carbonate cryst.	1 oz. (100 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

The sulphite should be dissolved first and next the hydroquinone, and last of all the carbonate. This is a slow-acting developer and gives rather strong contrasts. The temperature must not be allowed to fall below 60°F. (15°C), or the developer becomes inert.

For use take 1 part stock solution and one part water.

Metol-Hydroquinone.*

Metol	10 grs. (2·3 gms.)
Hydroquinone ...	30 grs. (7 gms.)
Sodium sulphite cryst.	320 grs. (73 gms.)
Sodium carbonate cryst.	320 grs. (73 gms.)
Potassium bromide	10 grs. (2·3 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

For use take 1 part stock

* See note in first column.

solution and 1 part water. This developer combines the qualities of metol and hydroquinone: it produces the maximum detail with good contrast.

Chlorquinol-Metol.*

Chlorquinol may be substituted in equal quantity for hydroquinone in the above formula, and gives very similar results.

Glycin.

Sodium sulphite, cryst.	600 grs. (137 gms.)
Glycin	120 grs. (27·5 gms.)
Sodium carbonate cryst.	600 grs. (137 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

The chemicals should be dissolved in the order in which they stand in the formula. It will be noticed that the glycin does not all dissolve until the carbonate is added.

Dilute 1 part to 4 parts water for dish development; the time required will be from 6 to 10 minutes according to the contrast in the subject and the type of negative required. For tank development, 1 part to 15 parts water, time 20 to 30 minutes.

Glycin gives clean, fine-grain negatives and keeps excellently.

Amidol.

Amidol gives soft and delicate negatives. It will however not keep and should be used the day it is mixed or the following day. The sulphite should be dissolved first.

Amidol	30 grs. (7 gms.)
Sodium sulphite, cryst.	240 grs. (55 gms.)
Potassium bromide	6 grs. (1·4 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

Maximum Energy Developer.

(Kodak D-82.)

Recommended for under-exposures.

Water ... ... (about 125°F.)	7½ ozs. (750 c.c.s.)
Wood alcohol ...	½ oz. (48 c.c.s.)
Metol	60 grs. (14 gms.)
Sodium sulphite (anhydrous)	230 grs. (52·5 gms.)
or crystallised	460 grs. (105 gms.)
Hydroquinone ...	60 grs. (14 gms.)
Caustic soda ...	38 grs. (8·8 gms.)
Potassium bromide	38 grs. (8·8 gms.)
Cold water to make	10 ozs. (1,000 c.c.s.)

Develop from 4 to 5 minutes at 65° F. (18° C.).

Two-Solution Developers.

Pyro-Soda.

B. J. Formula.

A.	Pyro	80 grs. (18·3 gms.)
	Sodium sulphite, cryst.	640 grs. (148 gms.)
	Potassium meta-bisulphite	80 grs. (18·3 gms.)
	Potassium bromide	20 grs. (4·6 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)
B.	Sodium carbonate, cryst.	640 grs. (148 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)

* See note on p. 309.

In mixing the A solution, the sulphite and metabisulphite should be dissolved first. 40 grains (9 gms.) of citric acid may be substituted for the metabisulphite. For use take A, 1 part; B, 1 part; water 2 parts.

This developer will produce negatives free from pyro stain, and development for 4 minutes at 65 degrees, with full exposure, will yield soft negatives full of detail well suited for enlarging. When stronger negatives are required the working solution is prepared by taking A, 1 part; B, 1 part and water 1 part, and developing for 5 to 6 minutes.

Solutions A and B will keep separately in thoroughly good condition for a very long time.

Metol-Hydroquinone.*

A.	Metol ...	20 grs. (4·6 gms.)
	Hydroquinone	60 grs. (14 gms.)
	Sodium sulphite, cryst.	640 grs. (148 gms.)
	Potassium bromide	20 grs. (4·6 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)
B.	Sodium carbonate, cryst.	640 grs. (148 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)

This developer yields negatives similar in strength and gradation to those given by pyro-soda, with absolute immunity from stain or discoloration even when diluted or the water bath used.

For negatives suitable for enlarging, take A, 1 part; B, 1 part; water, 2 parts. Development time about 4 minutes. For stronger negatives for contact printing, A, 1 part; B, 1 part; water, 1 part. Development time, 5 to 6 minutes.

Metol-Chlorquinol.*

Chlorquinol may be substituted in equal quantity for hydroquinone in the above formula; it gives very similar results.

Metol.*

A.	Metol ...	75 grs. (17 gms.)
	Sodium sulphite, cryst.	1¼ ozs. (125 gms.)
	Potassium bromide	16 grs. (3·6 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)
B.	Sodium carbonate, cryst.	1¼ ozs. (125 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)

For use, take: A, 1 part; B, 1 part; Water, 1 part.

Metol gives delicate negatives full of detail but with very little density unless development is greatly prolonged.

Pyro-Metol.

A.	Pyro	40 grs. (9 gms.)
	Metol ...	35 grs. (8 gms.)
	Potassium metabisulphite	90 grs. (20 gms.)
	Potassium bromide	15 grs. (3·5 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)
B.	Sodium carbonate cryst. ...	1½ ozs. (150 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)

Dissolve the metabisulphite first, then the pyro and when

* See note on p. 309.

that is dissolved add the metol.

For normal exposures of ordinary subjects, take A, 1 part; B, 1 part; water, 1 part. For under exposed plates increase the water to 4 or even 8 parts and allow longer time. This developer gives both detail and density quickly: the negatives are a pronounced brownish green colour, especially if the developer is diluted. They possess strong printing quality.

Metol-Pyro-Hydroquinone.

B. J. FORMULA.

A.	Metol ...	20 grs. (4·6 gms.)
	Pyro	30 grs. (7 gms.)
	Hydroquinone	30 grs. (7 gms.)
	Sodium sulphite cryst.	1½ ozs. (148 gms.)
	Citric acid ...	40 grs. (9 gms.)
	Potassium bromide ...	20 grs. (4·6 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)
B.	Sodium carbonate cryst. ...	1½ ozs. (148 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)

In preparing A solution, one-fifth of the sulphite should be dissolved first, then the metol, the remainder of the sulphite, citric acid, pyro, hydroquinone, bromide. If the pyro is added immediately after the metol, they both dissolve together in a few seconds.

For average subjects, take A, 1 part; B, 1 part; water, 2 parts. For softer results (portraits, etc.), the water may be increased to 4 or 6 parts.

This developer, though non-staining, combines the qualities of pyro and metol-hydroquinone. Solution A will keep in perfect working condition for a very long time, even if the bottle is frequently opened. If prepared with distilled water it is almost colourless. In cold weather, this stock solution may precipitate some of its contents. This can easily be avoided by making up the solution to twice the volume.

Negatives suitable for enlarging are obtained by developing for 4 minutes at 65° F., from average subjects. For stronger negatives, for contact bromide printing, 6 minutes, using A, 1 part; B, 1, part; water, 1 part.

Ferrous Oxalate.

A.—Potassium oxalate (neutral), 5 ozs. (120 gms.); hot water, 20 ozs. (500 c.c.s.). Cool, and pour off clear liquid.

B.—Warm water, 20 ozs. (500 c.c.s.); sulphuric acid, 30 minims (1·5 c.c.s.); sulphate of iron (ferrous sulphate), 5 ozs. (120 gms.).

Mix 1 oz. of B with 3 to 4 ozs. of A (pouring B into A).

Paraminophenol.

A.	Paraminophenol hydro-chloride	¾ oz. (75 gms.)
	Water, hot ...	6 to 7 ozs. (600 to 700 c.c.s.)

Filter this solution, if necessary.

B.	Sodium sulphite	45 grs. (10 gms.)
	Sodium carbonate, dry	150 grs. (35 gms.)
	Water ...	2 ozs. (200 c.c.s.)

Add B to A. The paraminophenol base is thrown down. When mixture is cool, filter off the deposit on cloth, and let

the paste dry until its bulk is not more than 3 ozs. (300 c.c.s.).

Then, in a graduate, mix it with 1 oz. (100 c.c.s.) of soda bisulphite lye 35° B., and add strong solution of caustic soda of 40° B. (about 50 per cent.) until the base is just dissolved. Water is then added to make 5 ozs. (500 c.c.s.). The solution is diluted 20 to 30 times for use.

TWO-SOLUTION.

A.	Paramino-phenol-hydro-chloride	100 grs. (23 gms.)
	Potassium meta-bisulphite	50 grs. (11·5 gms.)
	Distilled water to make	10 ozs. (1,000 c.c.s.)
B.	Sodium sulphite	270 grs. (62 gms.)
	Potassium carbonate	270 grs. (62 gms.)
	Distilled water to make	10 ozs. (1,000 c.c.s.)

For use, mix 1 oz. of A with 2 ozs. of B.

Maximum-Contrast Hydroquinone.

A.	Sodium bisulphite	110 grs. (25 gms.)
	Hydroquinone	110 grs. (25 gms.)
	Potassium bromide	110 grs. (25 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)
B.	Caustic soda	200 grs. (45 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)

For use, mix A and B in equal parts.

Film Quantity Developer.

The following metol-hydroquinone-pyro formula of the Kodak Co., is known as D75 and is for tank development of roll-film, etc., in about 10 minutes.

In making up 10 gallons of developer, 2 gallons of water are placed in the tank, Sol'n No. 1 added, then Sol'n No. 2, then No. 3 and No. 4—with thorough stirring after adding each. Finally add water to make 10 gallons, again with thorough stirring.

Solution No. 1.

Water (125° F.) ...	1 gall.
Elon (Metol) ...	1¼ ozs.

Solution No. 2.

Water (125° F.) ...	1 gall.
Sodium sulphite, cryst.	1 lb.
Sodium bisulphite	15 ozs.

Solution No. 3.

Water (160° F.) ...	1 gall.
Sodium sulphite, cryst.	14 ozs.
Hydroquinone ...	5 ozs.
Pyro	1¼ ozs.

Solution No. 4.

Water (125° F.) ...	1 gall.
Sodium carbonate, cryst.	5 lbs.

The developer should be kept at 68° F., never below 65° nor above 70°. For each degree above or below 68° allow one minute less or more in time of development. Time at 68° is 10 minutes.

For strengthening developer after use, a stock solution is kept at hand, viz. :—

Water (125° F.) ...	1 gall.
Elon (Metol) ...	1¼ ozs.
Sodium sulphite, cryst.	15 ozs.
Sodium bisulphite	7½ ozs.
Hydroquinone ...	2½ ozs.
Sodium carbonate, cryst.	3 lbs. 6 ozs.
Water, to make ...	2 galls.

A portion of this stock is mixed with an equal bulk of water before adding to the solution in the tank. Enough of this (diluted) solution is added to bring the tank developer back to its original volume.

Developer-Fixer for Ferrotypes.

Hydroquinone ...	100 grs. (23 gms.)
Sodium sulphite, cryst.	380 grs. (87 gms.)
Sodium carbonate, cryst.	270 grs. (62·5 gms.)
Hypo	2 ozs. (200 gms.)
Liq. ammonia (·880)	6 drachms (78 c.c.s.)
Water, to make ...	10 ozs. (1,000 c.c.s.)

Action is complete in 1 minute; then simply rinse in water.

Fine Grain Developers.

For work with miniature cameras a developer which produces images of fine grain is essential. In most cases the picture has to be enlarged considerably, and an image of coarse grain would only yield very coarse and unsatisfactory enlargements. It is, moreover, necessary to obtain a negative of soft contrast ($\gamma = 0{\cdot}8$) if enlargements of good gradation are to be obtained.

Metol-Hydroquinone Borax.

Kodak D.76: No. 1.

Metol	11 grs. (2·5 gms.)
Hydroquinone ...	22 grs. (5 gms.)
Sodium sulphite, cryst.	2 ozs. (200 gms.)
Borax	9 grs. (2 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

Time of development 9 to 12 minutes.

For softer results the proportions of metol and hydroquinone may be modified as in the following formula.

No. 2.

Metol	9 grs. (2 gms.)
Hydroquinone ...	11 grs. (2·5 gms.)
Sodium sulphite, cryst.	2 ozs. (200 gms.)
Borax	9 grs. (2 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

Time of development 9 to 12 minutes.

"Buffered Borax."

A modification of the preceding formula is that known as the "Buffered Borax." It will keep for weeks with no appreciable change in its action. It produces negatives with exceptionally fine grain.

Metol	9 grs. (2 gms.)
Hydroquinone ...	22 grs. (5 gms.)
Sodium sulphite, cryst.	2 ozs. (200 gms.)
Borax	9 grs. (2 gms.)
Boric acid ...	64 grs. (14·5 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

Time of development 18 to 24 minutes.

NOTE:

In all these three formulæ, it is desirable to dissolve a small proportion of the sulphite in about one-half of the water at about 125 degrees, add the metol, then while agitating the solution add the hydroquinone; dissolve the remainder of the

sulphite in the rest of the water at about 160 degrees, and when that is dissolved add the borax and boric acid. The two solutions are then mixed.

Glycin.

The glycin formula on page 310 produces negatives of fine grain, but still finer grain may be obtained by using para-phenylene-diamine either alone or in combination with glycin.

Para-phenylene-Diamine.

The finest grain is given by para-phenylene-diamine with sodium sulphite only, but it requires at least twice to three times the normal exposure.

The formula is :—

Para-phenylene-diamine	45 grs. (10·3 gms.)
Sodium sulphite, cryst.	525 grs. (120 gms.)
Water, to make	10 ozs. (1,000 c.c.s)

The para-phenylene-diamine should be dissolved in hot water, 160°F., and when thoroughly dissolved the sulphite is added.

Time of development 30 minutes at 65 degrees.

Para-phenylene-Diamine-Glycin (Sease No. 3).

Sodium sulphite (anhyd.)	390 grs. (90 gms.)
Glycin	22 grs. (5 gms.)
Para-phenylene-diamine (free base)	44 grs. (10 gms.)
Distilled water ...	10 ozs. (1,000 c.c.s.)

The chemicals are added, in the order stated, to the water at about 122° F. (50° C.) and then filtered.

A slight (30-50%) increase in exposure is required when using this formula. The time of development at 65° F. (18° C.), for a contrast of approximately gamma 0·8, is 10-15 minutes for emulsions of intermediate speed, and 15-20 minutes for super-speed emulsions.

Para-phenylene-Diamine with Tri-basic Sodium Phosphate.

A rather coarser grain than that given by the preceding formula results from the addition of tri-basic sodium phosphate and borax. Normal exposure only is then necessary, and the grain is still fine.

The formula is :—

Para-phenylene-diamine	52 grs. (12 gms.)
Sodium sulphite, cryst.	525 grs. (120 gms.)
Borax	160 grs. (36 gms.)
Tri-basic sodium phosphate	132 grs. (30 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

The para-phenylene-diamine and sulphite should be dissolved as described in the preceding formula, the borax and tri-basic sodium phosphate are then added. This developer does not keep well ; it should be used on the day that it is mixed or the following day.

Time of development about 35 minutes, according to the type of emulsion and contrast required.

Physical Development for Fine Grain.

(Odell's formulæ.)

Two processes have been worked out. In Process No. 1 the plate or film is developed in a solution containing hypo, sodium sulphite, silver nitrate and amidol. For this process the plate or film requires to be given an exposure exactly five times that which is correct for ordinary development. Development lasts about 1½ hours.

In Process No. 2, the plate is first put in a bath of sodium sulphite and potassium iodide for 1½ minutes and then developed in the same solution as used in Process No. 1. With this process exposures do not require to be longer than for ordinary development.

PROCESS NO. 1.

Stock Solution.

Hypo	1¾ ozs. (175 gms.)
Sodium sulphite, anhydrous	270 grs. (62·5 gms.)
Silver nitrate, cryst.	75 grs. (17 gms.)
Water, to make ...	10 ozs. (1,000 c.c.s.)

It is best to use distilled water for this solution, but not absolutely essential.

The order and method of mixing is very important. Dissolve the hypo and the sulphite in 6 ounces of water. Dissolve the silver nitrate in the remaining 4 ounces of water; *then add the silver solution to the solution of hypo and sulphite slowly*, stirring vigorously with a glass rod during the whole of the addition.

If the method of addition is accidentally reversed, silver thiosulphate will precipitate and promptly decompose into silver sulphide, thus being lost. The mixing is best carried out in subdued daylight and the combining of the two solutions done so slowly that the precipitate which forms is immediately dissolved on stirring.

The solution is quite stable and will keep indefinitely in the light in any bottle. If a cloudiness persists, due to impurities in the water, it may be necessary to filter it. If a slight black precipitate forms, this is probably due to impurities in the hypo, and as it settles it does no harm to the bath.

Mix :—

A.	Stock solution	1 oz. (50 c.c.s.)
	Water ...	1 oz. (50 c.c.s.)

In a separate graduate, dissolve :

B.	Amidol ...	3½ grs. (0·4 gm.)
	Water ...	2 ozs. (100 c.c.s.)

Mix A and B.

Physical development of plates or films *must* be carried out with the material lying flat in the tray. Tank development, *i.e.*, with the negatives standing on edge, is not possible.

For negatives physically developed in this formula, the exposure must be exactly five-times normal.

The exposed negatives are placed in the freshly-prepared developer, and the surface of each plate or film wiped gently with the ball of the finger, preferably with a rubber cap on it. This ensures thorough wetting of the emulsion surface and the avoidance of pin-holes, which latter seem to occur more

in physical development than in chemical development. The dish is then covered and allowed to stand for one and one-half hours at 65 to 70° F.

The development is greatest in the first hour. At the end of the 1½ hours, development should be complete. The operation is performed in the dark-room, and, still in the dark-room the negatives are removed, slightly rinsed, and placed in a tray containing ordinary acid fixing and hardening solution. They will appear to be cleared in the developer but they are not fixed. The hardener in the fixing bath toughens the film so that loose silver deposited on the surface may be wiped off with a bit of cotton. The fixing required is not long—a matter of a few minutes—after which the surface is again swabbed with cotton, and the negatives washed and dried as usual.

Exposure to light before fixing may result in partial reversal and brown stains and the solutions given are best used only once for a single set of negatives.

All dishes used for physical development must be chemically clean. Any dirt is fatal.

PROCESS NO. 2.

Fore-Bath.

Potassium iodide ...	48 grs. (11 gms.)
Sodium sulphite, anhydrous	120 grs. (27·5 gms.)
Water, to make ...	10 ozs. (1,000 c.c.s.)

The normally-exposed negative is placed in this fore-bath for exactly one and one-half minutes, removed and rinsed slightly, and then placed in the physical developing bath as described in Process No. 1.

The same precautions are observed as in Process No. 1 throughout, and after 45 minutes the negatives are examined. The negatives appear very different from those made by Process No. 1. The silver bromide in the emulsion has been changed largely to silver iodide, and the negatives do not clear up, but rather they have a white and very opaque appearance in the undeveloped portions. This condition requires longer fixation in the ordinary acid hypo bath (from 15 to 20 minutes) due to the slow solubility of the silver iodide. The fixation will be fully equal to, if not longer, than the usual fixing time in chemical development. The final washing should be about two hours in running water.

FIXING, HARDENING, AND DRYING.

Hypo Fixing Bath.

The average strength of hypo for fixing negatives is 4 ozs. per 20 ozs. (200 gms./litre). It should not be less, but may be more—5, 6 or 8 ozs.

A convenient method of keeping hypo is : dissolve each pound (500 gms.) in about 20 ozs. (600 c.c.s.) of water (hot), cool and make up to 32 ozs. (1 litre) in all. Every 2 ozs. (100 c.c.s.) of this stock solution contains 1 oz. (50 gms.) hypo.

In fixing plates or films, three rules should invariably be observed :—

1. Let plates remain in fixer as long again as it takes for the white opacity to dissolve away.

2. Always rinse fingers under tap or in a dish of water after touching hypo, do not simply wipe on a towel.

3. Avoid letting hypo droppings dry up on table or floor. If hypo solution drops or is splashed or spilt, mop it up and leave all clean.

Acid Fixing Baths.

Hypo	4 to 6 ozs. (200 to 300 gms.)
Potassium metabisulphite	½ oz. (25 gms.)
Water, to make	20 ozs. (1,000 c.c.s.)

Metabisulphite must not be added to hot hypo solution.

This is the best formula we know for an acid fixing bath for plates or papers. It keeps clear and stainless to the last, and does not throw down sulphur with use.

Extra-rapid Fixing.

Hypo	4 ozs. (200 gms.)
Ammonium chloride	½ to 1 oz. (25 to 50 gms.)
Water, to make	20 ozs. (1,000 c.c.s.)

The ammonium chloride is the commercial sal ammoniac as used for batteries. The bath fixes in about half the usual time but is not recommended for regular use.

Hardening-Fixing Baths.

No. 1.

A.	Hypo ...	5 ozs. (250 gms.)
	Water, to make	20 ozs. (1,000 c.c.s.)
B.	Sodium sulphite, cryst.	2 ozs. (100 gms.)
	Acetic acid glacial	3 ozs. (fl.) (150 c.c.s.)
	Alum ...	2 ozs. (100 gms.)
	Water (warm), to make	20 ozs. (1,000 c.c.s.)

Dissolve the sulphite in 5 ozs. (250 c.c.s.) of warm (not hot) water and allow to cool, then add the acetic acid little by little, stirring all the time. Dissolve the alum in 10 ozs. (500 c.c.s.) of hot water, allow to cool and add the sulphite and acid mixture. It is important that the mixing of these solutions be done at a temperature not exceeding 70°F. (20°C.). Finally make up to 20 ozs. (1,000 c.c.s.) with cold water.

To make the fixing-hardening bath, 2 parts of the B (hardener-solution) are added to 20 parts of the A (hypo) solution.

No. 2.

Hypo	8 ozs. (400 gms.)
Potassium metabisulphite	120 grs. (12·5 gms.)
Water, to make	20 ozs. (1,000 c.c.s.)

To this add :—

Chrome alum ...	240 grs. (27 gms.)
Water	20 ozs. (1,000 c.c.s.)

No. 3.

Hypo	5½ ozs. (275 gms.)
Sodium acetate	230 grs. (27 gms.)
Chrome alum ...	70 grains (8 gms.)
Water, to make	20 ozs. (1,000 c.c.s.)

Dissolve hypo in 16 ozs. of water, and add the sodium acetate. When this is in solution, add the chrome alum previously dissolved in the balance of the water.

For Extra Hardening.

For use at temperatures up to 95° F. (35° C.), the following fixing bath may be used. It is well to make it up fresh each week.

Hypo	5 ozs. (250 gms.)
Sodium sulphite, dry	1 oz. (50 gms.)
Formalin ...	2½ ozs. (fl.) (125 c.c.s.)
Water, to make	20 ozs. (1,000 c.c.s.)

Dissolve the hypo first, then the sulphite, and finally add the formalin.

Hardening Baths.

1. Formalin (40%)	1 oz. fluid. (50 c.c.s.)
Water, to make	10 to 20 ozs. (500-1,000 c.c.s.
2. Alum... ...	1 oz. (50 gms.)
Water, to make	20 ozs. (1,000 c.c.s.)
3. Chrome alum	1 oz. (50 gms.)
Water, to make	20 ozs. 1,000 c.c.s.)

Whichever bath is used, allow it to act for 15 or 20 minutes.

In making up the chrome alum bath, use cold or warm, but not hot water.

Hypo-Eliminator.

Wash the negative for one minute under the tap, and transfer to a shallow dish containing very weak (clear pink) potassium permanganate solution.

Remove the negative as soon as the colour goes (which will be in a few seconds if much hypo is present), and keep on treating in the very weak permanganate baths until the colour is not quickly discharged.

The water itself will destroy the permanganate colour, but not quickly as hypo does.

By this process a negative can be made ready for drying within three minutes of fixation.

Rapid Drying.

Method I.—Rinse from the hypo-bath, place in 1 : 50 formalin for ten minutes, wash by pouring nearly boiling water six times over the negative and dry by heat. To get rid of the relief which is produced by this process, the negative is rubbed with a piece of wash-leather moistened with alcohol.

Method II.—Soak in two successive baths of methylated spirit containing ten per cent. of water, and place in a current of air. Ordinary commercial spirit should not be used.

CLEARING & STAIN REMOVING.

Clearing Solutions.

ACID ALUM.

Alum	½ oz. (50 gms.)
Citric acid ...	¼ oz. (25 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

Wash well after fixing, and immerse the negative in the bath. This bath is also useful for removing white scum from negatives developed with ferrous oxalate if rubbed on with cotton wool.

CHROME ALUM.

Chrome alum	¼ oz. (25 gms.)
Hydrochloric acid	¼ oz. (25 c.c.s.)
or	
Citric acid ...	½ oz. (50 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

The bath containing citric acid is to be preferred.

Stain Removers.

ALUM-IRON.

The following solution acts on the yellowish stain in a pyro-developed negative, and yields a negative of much quicker printing quality. The solution is slow in action, requiring about 20 minutes.

Alum	½ oz. (50 gms.)
Ferrous sulphate	1½ ozs. (150 gms.)
Citric acid ...	½ oz. (50 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

In place of the citric acid 15 minims (3 c.c.s.) of strong sulphuric acid can be used.

THIOCARBAMIDE.

Thiocarbamide	44 grs. (10 gms.)
Citric acid ...	44 grs. (10 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

SODIUM HYPOCHLORITE.

(*Eau de Javelle.*)

This bath need only be resorted to in cases of severe stain, particularly on old negatives.

Bleaching powder	1 oz. (30 gms.)
Sodium carbonate, cryst.	1½ oz. (45 gms.)

Shake up the bleaching powder with a solution of the carbonate in a little water (6 ozs. or 180 c.c.s.), and filter. Stir up the residue with plain water, and again filter. The filtrate (solution of sodium hypochlorite) forms an active stain remover. It can be acidified with oxalic acid, and then discharges yellow stain still more vigorously, but with risk to the silver image.

N.B.—In either state (alkaline or acid) the solution has a strong softening action on gelatine. Negatives should not be left to soak longer than necessary (10 to 15 minutes) and should be carefully watched while in the reducer.

BLEACH AND RE-DEVELOP.

(*Ilford Formula.*)

For negatives which are very heavily stained by developer the following method of Ilford Limited is often the only one

which will entirely remove the stain. The negative is treated in a solution which simultaneously removes the stain and bleaches the silver image. This solution is :—

Potassium permanganate	25 grs. (5·5 gms.)
Common salt	55 grs. (12·5 gms.
Acetic acid (glacial)	4 drachms (50 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.)

If the negative is one freshly made, it is as well to pass it through a weak bath of chrome alum (about 50 grains in 10 ounces of water, or 10 gms. per litre) before applying the bleacher.

The bleacher is allowed to act for ten minutes, rocking all the time. It cannot harm the gradations of the negative, and this full time makes sure of the removal of the stain, and avoids a repetition of the process. After a brief rinse, the negative is left in a solution of potassium metabisulphite (1 ounce in 20 ounces of water) until white everywhere to the back of the film, and is then re-developed in any non-staining developer.

Silver Stains.

Most silver stains (due to dampness of paper or negative while the two are in contact) will readily yield to the following simple treatment.

Rub the stains on the dry negative with a tuft of cotton wool or a piece of rag thoroughly moistened with methylated spirit. A fairly firm pressure must be used, care being taken to avoid scratching the film. Then place the negative in very strong hypo solution. Here the stain disappears ; the time may be minutes or hours according to the depth and age of the stain.

In very severe cases the following method may be necessary :—

Soak the negative in :—

A.	Potassium iodide		200 grs. (45 gms.)
	Water	...	10 ozs. (1,000 c.c.s.)

and after washing transfer to—

B.	Potassium cyanide		300 grs. (70 gms.)
	Water	...	10 ozs. (1,000 c.c.s.)

in which rub the stained part of the film with a pledget of cotton wool.

If the stain does not yield to this treatment a solution of iodine (in potassium iodide) may be used in place of solution A, but it must be handled with very great care, since the iodine acts more powerfully and it is not at all an easy matter to remove the silver stain without affecting the silver image.

NEGATIVE INTENSIFIERS.

Negatives which are too soft (and, therefore, yield flat prints) may be greatly improved by intensification.

The plate should be thoroughly fixed and preferably well washed, but perfect fixation is imperative. Staining and other defects arise from imperfect fixing, not from insufficient washing.

If the plate is too soft, either through under-development or want of contrast in the subject, either the chromium or mercury intensifiers will give excellent results. Mercury, with alkaline development, may be applied several times in succession, if necessary, and a weak image strengthened to any desired extent.

If the plate is over-exposed, veiled and flat, giving a print of insufficient contrast, it should be reduced first with hypo and ferricyanide, and then after washing, intensified as suggested in the preceding paragraph. When a plate is intensified two or more times in succession, or reduced and intensified, it is desirable, whenever practicable, to dry it after each operation.

The copper and lead intensifiers give great density, and are suited only for negatives of line drawings, etc., in which great general opacity, and, at the same time, great clearness of the lines are required.

Intensification With Mercury.

Mercuric Chloride.

The negative is immersed in the following solution of mercuric chloride until the image is thoroughly bleached. This must be determined by examining the plate from the back. The solution can be used several times in succession until exhausted.

Mercuric chloride	120 grs. (27·5 gms.)
Water	10 ozs. (1,000 c.c.s.)

Very hot water should be used for dissolving the mercuric salt, and the solution used when thoroughly cool. It will keep indefinitely, even after being used.

When thoroughly bleached the plate should be washed for a few minutes and then given two or three acid baths, with rinsing between each.

Hydrochloric acid	30 minims. (5 c.c.s.)
Water	12 ozs. (1,000 c.c.s.)

The object of this acid treatment is to prevent an undesirable combination between the mercury and the gelatine film. After the acid baths the plate should be washed for a few minutes and the image blackened in very dilute ammonia (not exceeding 5 per cent.) or in either of the following solutions :—

A. Any non-staining alkaline developer, metol-hydroquinone, amidol, etc. This gives a moderate degree of intensification, sufficient for all ordinary cases that are likely to occur in the work of a careful photographer. The process can, however, be repeated as many times as desired. This is a valuable quality in cases of very difficult subjects where sufficient strength

cannot be obtained by any other means.

In this intensifier all tones in the scale are strengthened in equal proportion.

B. Sodium sulphite, 10% solution. This strengthens the negative very slightly. Repetition of the process gives no increase in contrast, but a plate bleached in mercuric chloride and blackened in sodium sulphite can be re-bleached and re-developed and an increase of density obtained equal to that given by mercury and development.

C. The ferrous oxalate developer may be used, but it possesses no advantage over alkaline development, and it gives identical results.

Mercuric Iodide.

Edwards's formula modified by W. B. Shaw.

One of the best general-purpose intensifiers, as the action takes place in one operation, and can be seen and stopped at any stage.

Mercuric iodide ...	90 grs. (20 gms.)
Potassium iodide	90 grs. (20 gms.)
Hypo	90 grs. (20 gms.)
Water	10 ozs. (1,000 c.c.s.)

Dissolve ingredients together in a very little water and dilute to the full amount afterwards.

The solution keeps well in the dark but soon spoils in the light.

For more gradual intensification, dilute with an equal quantity of water.

The negative should be washed for 5 minutes on removal from the fixing bath before intensifying and for 15 minutes after intensification.

If required, the intensification may be entirely removed in a 40 per cent. solution of hypo.

Negatives intensified as above are not fully permanent but may be made so by treating in a 1 per cent. solution of sodium sulphide until the image has been wholly changed—when viewed from the back—from grey to brown-black. Negatives so treated cannot be reduced with hypo solution.

Lumière Formula.

Sodium sulphite cryst.	2 ozs. (200 gms.)
Mercuric iodide	45 grs. (10 gms.)
Water	10 ozs. (1,000 c.c.s.)

The sulphite must be dissolved first. The solution keeps well in the dark.

This is a very convenient intensifier, as plates need only be rinsed for a few minutes in water on coming out of the hypo bath to be ready for intensification.

When intensified they are simply washed for a few minutes; the negative is then liable to yellow in time, but if placed for a few minutes in any non-staining developer the results are quite permanent.

If mercuric iodide is not available the following may be used :—

Mercuric chloride	50 grs. (11·5 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

Add 10 per cent. potassium iodide solution until precipitate

first formed is redissolved. About 1½ oz. (150 c.c.s.) will be required and when clear add—

Sodium sulphite, cryst.	2 ozs. (200 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

Intensification with Chromium.

An excellent and convenient method of intensification consists in bleaching the image in an acidified solution of potassium bichromate and then re-developing.

Two stock solutions are prepared, each of which will keep indefinitely. The working solution must be prepared at the time of using as it deteriorates rapidly.

The stock solutions are :—

A. Potassium bichromate ...	240 grs. (55 gms.)
Water	10 ozs. (1,000 c.c.s.)
B. Hydrochloric acid ...	1 oz. fl. (100 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.)

The degree of strengthening varies according to the proportions in which solutions A and B are mixed. Three good standard strengths are the following :—

Bleaching Baths.

	No. 1	No. 2	No. 3
A	1 part	1 part	1 part
B	¼ ,,	1 ,,	4 parts
Water,	6 parts	6 parts	6 ,,

The plate is immersed in No. 1, 2 or 3 until the image is thoroughly bleached, washed until the yellow bichromate stain is thoroughly removed, and then re-developed with any non-staining developer. Development should be carried out in white light, either artificial or diffused daylight.

No. 1, gives intensification about equal to mercury and development; No. 2, intermediate between Nos. 1 and 3 and No. 3, equal to mercury and sodium sulphite.

The process may be safely applied after fixation if the plate is simply washed for 10 minutes.

The No. 3 formula, which gives least intensification, may be used to strengthen weak bromide prints.

Silver Intensifiers.

ACID SILVER.

A. Pyro	15 grs. (3·5 gms.)
Citric acid ...	5-10 grs. (1-2 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)
B. Silver nitrate ...	100 grs. (23 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

About 1 oz. (35 c.c.s.) of A is poured over the plate once or twice, about 15 drops of B solution added, and the mixture again applied. Intensification now takes place, and the solution is poured off and on until sufficient. If intensifier becomes very thick and turbid, fresh should be mixed up. When dense enough the negative is rinsed, fixed and washed. Negatives are best hardened with alum or formalin before using this intensifier, otherwise it is difficult to avoid stains.

WELLINGTON'S FORMULA.

First harden the film in :— Formalin, 1 part; water, 10 parts, for five minutes. Rinse for a few minutes, and then place for *exactly one minute* in :—

Potassium ferricyanide	10 grs. (2·3 gms.)
Potassium bromide	10 grs. (2·3 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

This causes no apparent change in the negative; if used too long it will bleach the negative and alter its gradation. Rinse again for a few minutes and intensify.

Stock Solutions.

A. Silver nitrate ...	400 grs. (91·5 gms.)
Water (distilled), to make	10 ozs. (1,000 c.c.s.)
B. Amm. sulphocyanide	700 grs. (160 gms.)
Hypo	700 grs. (160 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

Take A, 1 oz. (100 c.c.s.), and add slowly to 1 oz. B (100 c.c.s.), stirring vigorously (mixture should be clear); then add 10% pyro solution (preserved with sulphite), 2 drachms (25 c.c.s.), and 10% ammonia solution, 4 drachms (50 c.c.s.).

Place negative in chemically clean dish, best of glass, and pour solution over it. Silver begins to deposit in a minute or two. When intensified enough, place in acid fixer and wash well. Flat negatives may be over-intensified, and then treated with Farmer's reducer.

Copper Intensifier.

Gives great intensification and is best suited for line subjects.

A. Copper sulphate	100 grs. (23 gms.)
Water, to make	1 oz. (100 c.c.s.)
B. Potassium bromide	100 grs. (23 gms.)
Water, to make	1 oz. (100 c.c.s.)

A and B are separately made up with hot water, mixed, and allowed to cool. The negative is bleached in the mixture, and washed for a minute or two. It is then blackened in :—

Silver nitrate ...	45 grs. (10 gms.)
Water (distilled), to make	1 oz. (100 c.c.s.)

For still greater density the negative is well washed from silver and an ordinary developer applied.

If too dense, after the silver, it can be placed in weak hypo solution (2 per cent.) or weak potassium cyanide (½ per cent.).

Copper Intensifier for Weak Negatives.

An intensifier suitable for dealing with ghosts of images is the following, due to M. G. Zelger of the Pathé-Cinema Laboratories. The negative is bleached in a mixture of 2 parts of A and 1 part of B.

A. Copper sulphate	45 grs. (10 gms.)
Acetic acid, glacial	270 minims. (56 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.

B. Potassium iodide	90 grs. (20 gms.)
Ammonia (0·880)	1 oz. (100 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.)

Negative bleaches to a yellowish colour and is then washed for about 20 minutes in running water. It is then darkened with :—Silver nitrate, 11 grs. (2·5 gms.); sodium acetate, 45 grs. (10 gms.); water, 10 ozs. (1,000 c.c.s.). To avoid stain, it is well to treat the negative with a solution of alum before using the darkening bath.

Lead Intensifier.

The lead intensifier gives very great intensification, and is suited only for line subjects.

Lead nitrate ...	200 grs. (45 gms.)
Potassium ferricyanide	300 grs. (68 gms.)
Acetic acid ...	1½ drachms (19 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.)

This stock solution will keep for a long time in the dark. The negative is bleached in it, washed once *very carefully* in 10 per cent. nitric acid—the acid makes the film very tender—then in water, and then darkened in :—

A. Sodium sulphite	½ oz. (50 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)
or in—	
B. Schlippe's salt ...	45 grs. (10 gms.)
Ammonia (0·880)	3 drachms (37·5 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.)
or in—	
C. Potassium bichromate	1 oz. (100 gms.)
Ammonia (0·880)	½ oz. (50 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.)

Any of the above darkening solutions gives great intensification.

Callier Formula.

This formula is specially suitable for gelatine plates.

Potassium ferricyanide	180 grs. (40 gms.)
Lead nitrate ...	260 grs. (60 gms.)
Acetic acid, glacial ...	1½ drms. (18·7 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.)

The negative is bleached in the above and then passed through three or four baths of :—Hydrochloric acid, 2½ drachms (30 c.c.s.); water, 10 ozs. (1,000 c.c.s.), remaining in each for about 5 minutes. Then wash until image is white and darken in weak solution of ammonium sulphide.

Uranium Intensifier.

A. Uranium nitrate ...	100 grs. (23 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)
B. Potass. ferricyanide	100 grs. (23 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

For use, take A, 4 parts; B, 4 parts; acetic acid, 1 part. After intensification, wash in several changes of *still* water until the yellow stain is gone. A 2 per cent. solution of ammonium sulphocyanide will remove any yellow stain; weak ammonia or sodium carbonate removes the intensification and restores the negative to its original condition. If to be re-intensified, first bathe in weak acetic acid.

NEGATIVE REDUCERS.

It should be recognised that all reducing processes, excepting the rehalogenisation method, are progressive, *i.e.*, the operation can be stopped at any stage by judgment of the effect produced. At any future time reduction can be resumed, continuing exactly as if taken to a later stage at first.

Reduction is useful if the negative is so dense (black) that it takes long to print. Also, apart from reducing time of printing, reduction is used to improve the gradation of negatives.

For those which are too hard, usually as the result of under-exposure and too long development, the best reducer is the "proportionate" one of permanganate and persulphate.

For those which, though dense, yield prints which are too flat—this is the result of great over-exposure and long development—the best is Farmer's. Belitski's is similar.

Even when density is not excessive, it is usually well, in the case of flat negatives, to reduce a little in "Farmer's," and then intensify.

The other reducers—Eder's and iodine-cyanide—are used chiefly when it is desired to carry out a little reduction of negatives of good gradation.

Howard Farmer's.

This reducer produces a greater effect on the shadow detail or weak deposits than on the dense parts of a negative. For this reason, it tends to increase rather than decrease contrast while reducing the actual density.

Two solutions are required:

A.	Hypo about	2½ oz. (125 gms.)
	Water, to make	20 ozs. (1,000 c.c.s.
B.	Potassium ferricyanide	1 oz. (100 gms.
	Water, to make	10 ozs. (1,000 c.c.s.)

The working solution is prepared by adding from 25 to 60 minims of B to each ounce of A (5 to 12 c.c.s. B to 100 c.c.s. A) The larger the quantity of B the more rapid is the action but beyond this there is practically no difference. The addition of B to A must only be made at the moment of using, as the mixed solution deteriorates very rapidly: it is quite useless in a few minutes. It should be lemon-yellow: if it acquires a blue-green tint in use it should be thrown away and fresh solution substituted. It must never be used for two or more negatives in succession.

Belitski's.

Potassium ferric oxalate	214 grs. (48 gms.)
Sodium sulphite, cryst.	175 grs. (40 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

Dissolve and add :—

Oxalic acid	50 to 65 grs. (12 to 15 gms.)

and shake until the solution turns green. Then pour off from undissolved crystals and add :—

Hypo	2½ ozs. (250 gms.)

This reducer is stainless, and keeps well in the dark. Its action on the shadow detail of the negatives is similar to that of Farmer's. It varies somewhat with the strength of the solution.

Instead of the ferric oxalate the following more easily obtainable chemicals can be used in the formula :—

Ferric chloride ... cryst.	142 grs. (32·5 gms.)
Potassium oxalate	272 grs. (62·5 gms.)

Proportionate Reducer.

A mixed reducer of permanganate and persulphate, originally suggested by N. C. Deck, is found to act proportionately on the densities of a negative, thus reducing contrast. The following formula is that worked out by Kenneth Huse and Adolph H. Nietz, of the Eastman Research Laboratory.

A. Potassium permanganate	1·1 grs. (0·25 gm.)
Sulphuric acid	65 minims (15 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.)

The sulphuric acid is a 10 per cent. solution by volume of the 1·84 strong acid.

B. Ammonium persulphate	110 grs. (25 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

These stock solutions keep well separately ; they are mixed together at the time of use in the proportion of 1 volume of A to 3 volumes of B to form the working reducer. Reduction takes from 1 to 3 minutes.

After reduction, soak the negative for 5 minutes in a solution of 90 grs. (10 gms.) potassium metabisulphite in 20 ozs. (1,000 c.c.s.) of water, and then wash for a short time.

Persulphate.

The persulphate reducer acts first on the heavy high-light densities of the negatives, reducing these without affecting shadow detail. It thus "softens" a hard negative.

Ammonium persulphate	100 to 200 grs. (22 to 45 gms.)
Water, to make ...	10 ozs. (1,000 c.c.s.)

A fresh solution is made at time of use. A drop of sulphuric acid per 2 ozs. (60 c.c.s.) makes the action more regular. A contributor, Mr. A. H. Hall, recommends the following method of using it as infallible. Dry the negative, wet it well, give it a rinse in hypo-eliminator, wash for a few minutes. Make up fresh persulphate solution in water previously acidulated with a drop or two of sulphuric acid, pour on the reducer and rock the whole time. When the milky deposit begins to appear, note the time and continue for 20-30 seconds, for slight reduction, increasing the time for heavier reduction.

If no action is seen in two minutes, throw the solution away, wash the negative, and repeat. If much reduction is required—when the solution appears opalescent, throw it away and pour on fresh.

H. W. Bennett's Formula.

Ammonium persulphate	480 grs. (55 gms.)
Sodium sulphite, cryst.	90 grs. (11 gms.)
Sulphuric acid (10% sol'n) ...	1 oz. (50 c.c.s.)
Water, to make ...	20 ozs. (1,000 c.c.s.)

This is a stock solution which will keep in good working condition for a long time. For use, equal parts of the stock solution and water should be mixed.

It is essential that the plate to be reduced should be soaked in water for at least an hour before reduction is commenced. Reduction should not be continued after the solution becomes slightly milky.

As soon as the negative is sufficiently reduced, it should be rinsed rapidly and placed for one minute—*not longer*—in a weak hypo bath (1 oz. of hypo to 20 ozs. (50 gms. in 1,000 c.c.s.)) and then washed.

Iodine-Cyanide.

A very clean-acting (but intensely poisonous) reducer. Very suitable, when used with the further addition of water, for bromide prints, as it leaves no stain.

Iodine (10%sol.)	300 minims (60 c.c.s.)
Potassium cyanide (10% sol.)	50 minims (10 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.)

To make the iodine solution mix about 150 grs. (35 gms.) potassium iodide with just enough water to dissolve it, add 44 grs. (10 gms.) iodine flakes, which will dissolve in an instant on stirring, and add water to make 1 fluid oz. (100 c.c.s.).

Permanganate.

Potassium permanganate (5% sol.)	2 drs. (12 c.c.s.)
Sulphuric acid ... (10% sol.) ...	10 drs. (60 c.c.s.)
Water, to make	20 ozs. (1,000 c.c.s.)

The sulphuric acid is a 10 per cent. solution by volume of the 1.84 strong acid.

Applied to a wet negative, gives even reduction. A dry negative receives greater reduction in the high lights. Any brown stains are removed with a 10 per cent. solution of sodium sulphite containing 2 per cent. oxalic acid.

Reducing Harsh Negatives.

A very valuable and safe method of reducing harsh negatives consists in re-halogenising and re-developing.

The negative is first bleached in a solution consisting of 1 part of a 5 per cent. solution of potassium bichromate, 1 part of a 10 per cent. solution of hydrochloric acid and 6 parts of water. It is then washed until the yellow staining disappears, which will require about twenty minutes, and then re-developed and fixed.

Any non-staining developer may be used, but it should be weak, not more than half a grain of the developing substance to each ounce of water; that is, an ordinary negative developer diluted to about one-fourth of its normal strength. Even in this weak solution development is fairly rapid, and it should be stopped at an early stage if a moderate degree of reduction is required. If taken too far the plate will not be reduced at all, but intensified. Considerable practice is necessary before the exact degree of reduction can be judged correctly. The method is so valuable that it is well worth while to experiment with three or four waste negatives as a guide for future work.

NEGATIVE VARNISHES.

How to Varnish.

Using Cold Varnish.

First place negatives where they will become perfectly dry,

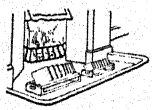


Fig. 1.



Fig. 2.

e.g., near a fire (fig. 1) or on a bath hot water tank.

Next lay out to get quite cold (fig. 2).

Dust negatives with a strip of cotton plush or camel's hair brush (fig. 3).

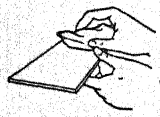


Fig. 3.

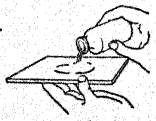


Fig. 4.

Poise negative on tips of fingers, steady with thumb and pour pool of cold varnish on to centre of the negative (fig. 4). Use plenty of varnish.

Let pool spread of itself (fig. 5).

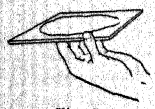


Fig. 5.

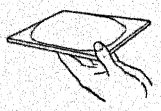


Fig. 6.

Now incline plate so as to cause the varnish to flow into right-hand corner (fig. 6).

Then into the left-hand far corner (fig. 7).

Then into the left-hand near corner (fig. 8).

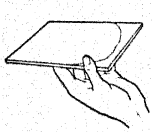


Fig. 7.

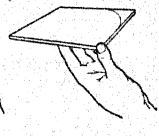


Fig. 8.

Finally raise the negative so as to let the excess of varnish flow back into the bottle (fig. 9).



Fig. 9.



Fig. 10.

In tilting the negative to distribute the varnish, return the plate to the level position *a little before* varnish has reached the corner; the wave of varnish will carry the coating into the corner, and you will avoid getting varnish on the glass side or up your sleeve.

As last drops of varnish run into the bottle, rock negative to and fro (fig. 10), so as to avoid a streaky coating. Then stand the negative on edge on blotting paper to dry.

Cold Varnishes.

Celluloid ...	1 oz. (10 gms.)
Amyl acetate ...	50 ozs. (500 c.c.s.)

To counteract the sickly odour of amyl acetate, add a small proportion of oil of lavender.

This may be flowed over or applied with a brush to the cold negative.

Zanzibar copal	6 ozs. (30 gms.)
Amber (fused)	1 oz. (5 gms.)
Ether	60 ozs. (300 c.c.s.)
Acetone ...	40 ozs. (200 c.c.s.)
Chloroform ...	4 ozs. (20 c.c.s.)

20% shellac solution	2 ozs. (160 c.c.s.)
Ammonia (0·880)	3 drs. (30 c.c.s.)
Methylated spirit	4 ozs. (320 c.c.s.)

A mixture of Japanese gold size (1 part) and benzole (2 parts) forms a rather slow-drying though otherwise excellent cold varnish. The surface takes the pencil well.

Water Varnish.

Shellac	3 ozs. (100 gms.)
Sodium carbonate (saturated sol.)	24 ozs. (800 c.c.s.)

The shellac is allowed to soak in the liquid for twenty-four hours; the liquor is then poured away and replaced by an equal quantity of water, and the mixture boiled until the shellac dissolves. After standing some time the liquid becomes perfectly clear and bright.

Hot Varnishes.

1.

Sandarac ...	1 oz. (55 gms.)
Seed lac ...	1½ oz. (83 gms.)
Castor oil ...	3 drs. (20 c.c.s.)
Oil of lavender...	1½ drs. (10 c.c.s.)
Alcohol ...	18 ozs. (1,000 c.c.s.)

This varnish is somewhat dark in colour.

2.

Best orange shellac	2½ ozs. (125 gms.)
Oil of lavender...	¼ oz. (12·5 c.c.s.)
Methylated alcohol	20 ozs. (1,000 c.c.s.)

Instead of oil of lavender, oil of turpentine (pure) can be used.

Keep in a warm place until dissolved; then add a large teaspoonful of whiting or prepared chalk; shake, set aside to clear, and then decant. This is specially recommended for gelatine negatives.

3.

White hard varnish	15 ozs. (150 c.c.s.)
Rectified spirit	20 to 30 ozs. (200 to 300 c.c.s.)

Methylated spirit should not be used. This will be found a good varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off.

4.

Seed lac ...	2 ozs. (50 gms.)
Sandarac ...	2 ozs. (50 gms.)
Oil of lavender...	½ oz. (12·5 c.c.s.)
Castor oil ...	1 oz. (25 c.c.s.)
Alcohol... ...	40 ozs. (1,000 c.c.s.)

To prepare a good surface for the retouching pencil, the negative after varnishing is dusted

over with fine resin powder and rubbed up with the fingers.

5. Sandarac	...	4 ozs. (115 gms.)
Alcohol...	...	28 ozs. (800 c.c.s.)
Oil of lavender		3 ozs. (85 c.c.s.)

This is a good varnish for retouching upon, and a tooth is easily obtained by rubbing.

For Film Negatives.

Water Varnish.

Borax ...	...	300 grs. (35 gms.)
Glycerine	...	300 minims (30 c.c.s.)
Shellac ...	...	600 grs. (70 gms.)
Water ...	...	20 ozs. (1,000 c.c.s.)

Boil together for about half-an-hour, then add—

Methylated spirit	5 ozs. (250 c.c.s.)

and filter.

Dammar Varnish.

Dammar	...	1 oz. (100 gms.)
Benzole, 90%	...	10 ozs. (1,000 c.c.s.)

Filter. Benzole (*viz.*, benzene, not "benzoline") must be of the 90% strength.

Retouching Medium.

C. H. Hood's Formula.

This formula for a medium for application to film or plate negatives or positives (or bromide prints) for imparting the necessary "tooth" to the surface to facilitate handwork with the pencil, if properly carried out, does not leave any visible sign of having been applied; the surface is quite dry a few minutes after application and is quite non-tacky, thereby avoiding collection of dust particles.

Gum dammar	...	½ oz.
Benzol or xylol	...	8 ozs.
Turps	...	2 ozs.

(The gum dissolves in about an hour, depending on size of the gum pellets.) Xylol is preferable as it is much less inflammable than benzol.

Note: If benzol is used it should not be "Rectified Benzol" as this will not dissolve the gum.

Lay the film, plate or print face upwards on a clean piece of paper, about 3 ins. larger all round.

Use a 2 in. square of clean soft rag made into a small pad; saturate it with the medium. Apply this to the film (but not so liberally that it runs underneath) then immediately smooth out the coating by using a large pad of clean soft dry cloth—for instance an old linen handkerchief—working with a circular motion until a slight resistance is felt. Do not polish too long or a streaky effect will be produced.

It is sometimes advantageous to coat and work on both sides of a film. A good quality B pencil is preferable. This medium has the convenient property of filling small scratches and abrasions in the gelatine.

If coating a very small film or print, for ease of handling secure it temporarily to the paper with strips of rubber adhesive tape.

If it is required to remove the medium, use benzol or xylol. For miniature negatives, dip them in a dish of the solvent.

Ground-Glass Varnish.

Sandarac	...	90 grs. (10 gms.)
Mastic ...	...	20 grs. (2·25 gms.)
Ether (0·720)	...	2 ozs. (100 c.c.s.)

Dissolve the resins in the ether and afterwards add—

Benzole	...	½ to 1½ozs. (25-75 c.c.s.)

The proportion of the benzole added determines the nature of the matt obtained.

This varnish must be applied to the cold negative or the coating will not be matt.

Tinted Varnish.

Malachite green, aurantia, or asphaltum is used for tinting the above matt varnish green, yellow, or brown respectively (for handwork on the back of a glass negative).

For the occasions, however, when a tinted matt varnish is required only in small quantity, *e.g.*, for equalising the printing density of a negative, as convenient a means as any is to add a little ordinary iodine (flakes) to the ground glass varnish made in accordance with the above formula.

Spotting Medium.

Indian ink—Water colour.
Payne's grey-Water colour.

Grind together with water only on a palette to match the colour of the negative.

Another spotting medium may be very readily compounded by thinning down ordinary sepia moist water-colour with black writing ink to the consistency of cream.

Blocking-Out Mixtures.

1.—Indian red water-colour (student's quality in tubes) is a good mixture for blocking out. It should be thinned down sufficiently to work freely. It does not crack or peel off.

2.—Commercial "Brunswick black" forms an excellent blocking-out mixture for large work, and is quickly applied with a brush.

3.—When printing on development papers, yellow or orange dye (*e.g.*, Vanguard yellow) is a convenient blocking-out medium which is easier in use owing to its transparency. First go over the film with ox-gall on wet cotton wool; the dye then diffuses slightly beyond the edge of the brush work and avoids harsh lines.

In the case of subjects containing detail such as ladies' hair, or drapery, a weak dye application over the outline will add the necessary density to the background without clogging the hair. Then proceed as usual with a stronger wash, when stray bits not wanted to print can be taken off without leaving a sharp edge.

Titles on Negatives.

The usual method is to have the words forming the title set up in type and photographed on a "process" plate. The subject negative having been made with a clear margin round it, a strip of the title negative is laid down on this margin by stripping and the clear margin then filled up with "Photopake" or other blocking out mixture except over the strip of title, which is made

dense enough, in the first instance, to print white. If a clear portion in a landscape negative cannot be found (in cases where the title has to appear on the view), a piece must be cut out with a sharp knife.

An alternative method is to cut away part of the negative film (round the subject), lay on the title strip and then fill in with opaque except over the title strip.

A plan frequently adopted consists in drawing the lettering, *reversed*, in opaque water-colour on a medium or dense part of the negative. This necessitates a capacity for drawing small letters neatly and correctly and reversing them in drawing. (See also Epitome of Progress.

A very fine mapping pen is the best tool, and it must be used lightly so as not to scratch the gelatine film. A pencil line may be drawn on the film so as to keep the line of letters perfectly straight. Indian red is the best colour to use; it is very opaque and it is more easily seen in working than a black colour.

DEVELOPER POISONING.

Some photographers are, by reason of a very sensitive skin, susceptible to the action of alkaline developers, especially those containing metol or para-phenylene-diamine, and occasionally severe irritation or rash may result.

The best preventative is to keep handy in the darkroom an acid bath as follows:—

Hydrochloric acid, pure 20 drops
Water ... ... 20 ozs.

and to dip the fingers in this before starting and fairly frequently while developing.

The acid stops the action of the developer by neutralising the alkali in the same way as an acid "stop" bath does with prints.

The developer solution should never be allowed to dry out on the hands, after developing is finished the diluted acid bath should be used and the hands rinsed before drying. If the acid bath is not handy then rinse in warm water as advised but soap should not be used until all the developer is removed from the skin.

In cases where the skin is already affected, the following ointment will be found to have a beneficial effect:—

Ichthyol ...	...	10 grs.
Lanoline ...	...	40 grs.
Boric acid	...	40 grs.
Vaseline ...	...	30 grs.

Apply two or three times a day, and rub well in before retiring for the night.

The use of the above-mentioned acid bath will also be found to counteract the staining of the hands when developing large quantities of prints or negatives.

STRIPPING.

Glass Negatives.

The following process (of Middleton and Holcroft) is a very reliable one for stripping the film from a glass negative and transferring it (with or without reversal) to a second glass plate or other support.

The materials are :—

Stock solution :

Methylated spirit	25 parts.
Water	1 part.
Glycerine ...	1 part.

Some commercial hydrofluoric acid. NOTE : This must be kept in a gutta percha bottle, and not allowed to come in contact with glassware, which it attacks.

Waxed paper, made by soaking thin note paper in hot melted paraffin wax for half an hour.

A bow of thin cane fitted with a waxed silk thread.

Wooden window wedges, weak gum solution and a sharp penknife.

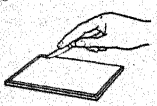


Fig. 1.

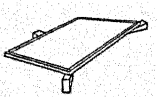


Fig. 2.

Cut through the film all round the negative at a distance of about one-eighth of an inch (3 mm.) from the edge (fig. 1).

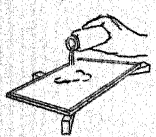


Fig. 3.

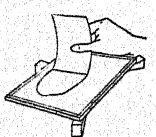


Fig. 4.

Place the negative level on three wooden wedges (fig. 2).

Pour on " stripping solution " made by adding from 6 to 30 drops of hydrofluoric acid to 1 oz. (30 c.c.s.) of the stock solution (fig. 3).

Spread the mixture with an end of paper (fig. 4).

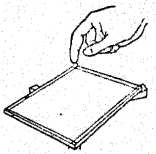


Fig. 5.

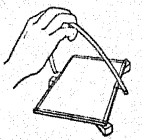


Fig. 6.

After a minute or so try (with the finger) if the edgings of film are loose, and remove them as soon as they come away without any pull whatever (fig. 5).

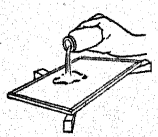


Fig. 7.

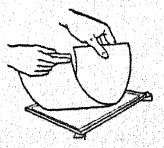


Fig. 8.

Now test if the whole film is loose by passing the waxed silk thread underneath (fig. 6).



Fig. 9.



Fig. 10.

If all is free, pour on some plain stock solution (fig. 7), and apply a sheet of waxed paper (fig. 8).

Squeegee down the waxed paper lightly (fig. 9).

Then remove paper and negative film together in contact by slipping the blade of a penknife under the film (fig. 10).

Now apply the paper, with the negative film on its under side, to a glass plate previously coated with very weak gum solution, dried and flowed over with stock solution (fig. 11).

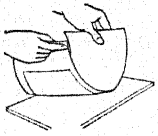


Fig. 11.

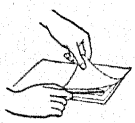


Fig. 12.

Then squeegee down (fig. 9) and remove the waxed sheet, using the blade of the penknife to keep the corner of the film to the glass (fig. 12).

If it is desired to reverse the negative (as regards right and left), the film is transferred from the first sheet of waxed paper (fig. 10) to a second sheet of the same material. Sheet No. 1 is then pulled off and the negative film applied to a glass plate prepared with gum, etc., as already described.

FOR OLD NEGATIVES.

A less rapid solution, but one which will be safe in the case of an old or hardened negative, is :—

Methylated spirit	1 oz. (100 c.c.s.)
Water	2 ozs. (200 c.c.s.)
Hydrofluoric acid	60 mins. (12·5 c.c.s.)

These proportions may be slightly altered for different commercial spirits and acids.

It is better to use this formula for negatives which may have become hard or horny with age.

Dry Stripping.

A useful and speedy method of stripping the film off glass plates in a dry condition for carbon printing, etc., is the following :—The negative is thoroughly washed after fixing.

Then immerse for five minutes in a solution of potassium carbonate (9 ozs. potass. carbonate in 8 ozs. of water). Remove from the solution and blot off surplus moisture with a soft cloth, rub dry with another cloth, and then cut through the film with a penknife at the top edge.

When thoroughly dry, *i.e.*, in about 10 minutes, insert a needle under the film at the top corner and pull steadily, when the film will be found to leave the glass with perfect ease and certainty. This method appears to have no deleterious effect on the film at all.

Sterry Process.

The following is also for stripping films from glass negatives, especially when the negatives are to be permanently kept in the film form.

The negatives are immersed for thirty minutes in :—

Potassium carbonate saturated solution	2 ozs. (20 c.c.s.)
Glycerine ...	1 oz. (10 c.c.s.)
Formaline ...	1 oz. (10 c.c.s.)
Tap water ...	50 ozs. (500 c.c.s.)

This mixture is cloudy soon after making, and must be either filtered or decanted from the sediment. The plates, after immersion, are stood to drain for a few moments, and the solution mopped off them with an old soft handkerchief made into a pad. They are then put aside, where they will dry slowly

and uniformly, requiring, as a rule, at least six hours, and better twelve or more.

To strip them, all that is then necessary is to cut round with a sharp knife about $\frac{1}{8}$th in. from the edge of the plate, when, on lifting one corner, the film will separate easily, and lie perfectly flat. Longer immersion in the mixture or more formaline added causes the edges of the films to separate and curl up.

A greater proportion of formalin so hardens the film that it splits on drying. Artificial heat makes the stripping irregular, or the film may refuse to leave the glass. The remedy is to allow the plates to stand where they can absorb moisture before stripping.

The process is of no use for stripping negatives on celluloid film.

Film Negatives.

In the case of negatives on celluloid cut or rollfilm the following is a suitable method :—

Caustic soda	...	100 grs. (23 gms.)
Formalin	...	100 minims (21 c.c.s.)
Water ...	...	10 ozs. (1,000 c.c.s.)

The celluloid negative is immersed in this solution until the film shows signs of detachment, and can be rolled back with the finger. It is then placed in—

Hydrochloric acid		25 minims (5 c.c.s.)
Glycerine	...	25 minims (5 c.c.s.)
Water ...	...	1 oz. (100 c.c.)

in which it is removed from its original support to a glass or other base.

Wet-Collodion Negatives.

When the negative is thoroughly dry and cool flow over with a thin solution of rubber in benzole, 2 parts pure rubber to 100 parts benzole, or ordinary cycle tyre repairing solution thinned down to about the consistency of collodion will do.

When this is dry, the negative is flowed over with " leather " collodion. This is prepared by adding a small quantity of castor oil to plain collodion. A good formula is as follows :—

Celloidin	...	$\frac{1}{2}$ oz. (5 gms.)
Ether ...	...	5 ozs. (50 c.c.s.)
Alcohol ...	...	5 ozs. (50 c.c.s.)
Castor oil	...	$\frac{1}{2}$ oz. (5 c.c.s.)

When the collodion on the negative is dry (the drying can be hastened by heat), the negative is cut round the edges with a knife, and placed in a dish of cold water. The film should soon begin to loosen at the edges ; if it does not, a little acetic acid (up to 10 per cent) may be added to the water.

The film is now transferred to a piece of paper, and thence to the new support. If the negative is to be reversed it is transferred to another piece of paper before being placed on its final support.

PLAIN PAPERS.

The following are formulæ for "salting" and sensitising papers such as Whatman's drawing papers.

Formulæ such as these, which were largely used in the days before the industrial manufacture of printing papers, yield sensitive coatings which keep in good condition only for a few days. Moreover, they require a negative of very considerable vigour; a negative which prints well in P.O.P. is not nearly vigorous enough. In addition to this, it is necessary to over-print to an appreciable extent, since prints lose depth in the toning and fixing baths. Despite these drawbacks, the formulæ are deserving of more notice than they now receive, especially for the sensitising of fabrics such as silk, satin, cotton.

First prepare the plain paper with—

Ammonium chloride	60 to 80 grs. (7 to 9 gms.)
Sodium citrate ...	200 grs. (23 gms.)
Sodium chloride	40-60 grs. (5 to 7 gms.)
Gelatine	20 grs. (2·3 gms.)
Distilled water, to	20 ozs. (1,000 c.c.s.)

or—

Ammonium chloride	200 grs. (23 gms.)
Gelatine	20 grs. (2·5 gms.)
Water, to ...	20 ozs. (1,000 c.c.s.)

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added. The solution is filtered, and, when still warm, the paper floated upon it for three minutes and dried.

The salted paper is sensitised upon a neutral 45-grain silver bath.

PLATINUM TONING BATH.

Potassium chloro-platinite ...	9 grs. (1 gm.)
Water	20 ozs. (1,000 c.c.s.)
Nitric acid ...	4-6 drops (7-10 drops)

The fixing bath should be slightly alkaline in order to neutralise any trace of acid remaining in the print. A good formula is :—

Hypo	3 ozs. (150 gms.)
Sodium carbonate 10 % sol.	240 minims (28 c.c.s.)
Water, to make	20 ozs. (1,000 c.c.s.)

Gold Toning.

A very satisfactory toning bath, which may be kept as a stock solution, is :—

Gold chloride ...	15 grs. (1 gm.)
Sodium acetate	450 grs. (30 gms.)
Water, to make	35 ozs. (1,000 c.c.s.)

For use, 1 part of the stock solution is diluted by adding 7 parts of water. 1 fluid ounce should be allowed for each whole plate print; 30 c.c.s. for each print 22 × 16 cms., or the equivalent in smaller sizes.

A good black tone may be obtained by toning first in gold and then in platinum. Whether gold alone, or gold and platinum are used for toning, the alkaline fixing bath given above should be used.

SELF-TONING PAPERS.

Self-toning papers are made with both collodion and gelatine emulsions. Generally speaking the gelatine papers yield a greater variety of tones according to the strength of the hypo fixing bath, and the time of immersion of the print. On the other hand the collodion papers exhibit greater certainty in the tone which they yield by simple fixation in hypo.

Printing.

The paper should be exposed under the negative until the picture is considerably darker than the finished print is required to be. With many papers the printing should be continued until the shadows of the picture show a species of metallic bronze, while at the same time the lightest parts of the subject, usually the sky, are quite perceptibly darker than the unexposed paper.

The more rapidly the paper is printed the greater the degree of over-printing which is necessary; prints which require a very long exposure, owing to the great density of the negative or the weakness of the light, need very little over-printing.

Washing.

Although some makers do not advise it, it is better to wash prints before toning, since this conduces to greater permanency of the result. Prints are washed in running water or in four or five changes of clean water, keeping them moving.

Collodion prints are very liable to curl up in the washing water to an awkward extent. This can be avoided by placing them in the first instance in very little water—only enough to cover one or two prints. Several prints are laid face down in this water one after the other, placing each one in as soon as the preceding one has been wetted all over, and before it has had time to curl. The upper prints thus keep those below them fairly flat, and the prints show much less curl during the further washing, etc., in a greater depth of water or fixing solution.

Fixing-Toning.

The prints are fixed and at the same time toned to a rich sepia colour by immersion in a plain solution of hypo. The makers' instructions should be followed. A very usual strength is:

Hypo	...	4 ozs. (200 gms.)
Water, to	...	20 ozs. (1,000 c.c.s.)

With some papers it is an advantage to add a pinch or two of bicarbonate of soda to the fixing bath. This is especially so in the case of papers which it is directed should not be washed before fixing.

Purple Tones.

In place of the first washing in water, prints are soaked for about 5 minutes in :—

Common salt	...	2 ozs. (100 gms.)
Water, to	...	20 ozs. (1,000 c.c.s.)

They are then washed in two

changes of water and then fixed as directed above.

Two-Colour Prints.

Very pleasing colour effects can be obtained by painting parts of the dry print with the above salt solution, using a camel hair brush. On then fixing the whole print in the ordinary way, the parts which have been treated with the salt will tone to a purple, while the untreated parts will come out a warm brown. Especially with portraits, this process yields some very pleasing results.

GELATINE P.O.P.

P.O.P. prints may be toned and fixed in separate baths or toned and fixed at one operation in a combined toning and fixing bath.

For separate toning and fixing, and for some combined baths, the prints should be washed in several changes of water before toning. Then, after toning they should be washed in two or three changes of water and fixed. Finally they should be washed in running water, or in water completely changed at frequent intervals for one or two hours.

Prints may be toned with platinum instead of gold, the manipulation being the same as described for gold toning. Platinum toning is best suited to matt surface paper.

Gold Toning Bath.

The following is the best and most generally used toning bath for P.O.P., and yields fine purplish tones.

Gold chloride ...	1¼ grs. (0·3 gms.)
Ammonium sulphocyanide ...	15 grs. (3·5 gms.)
Water	10 ozs. (1,000 c.c.s.)

It is necessary for this and all sulphocyanide baths to ripen. The best method of mixing is to boil the water and to dissolve the gold in one half and the sulphocyanide in the other while the water is hot. Then pour the gold into the sulphocyanide in small doses, stirring all the time; use when cool. If cold water is used, the mixture should be allowed to stand 12 hours.

Stop for Gold Toning.

A weak solution of sodium sulphite (5 grs. per oz. or 10 gms. per litre) at once stops the action of a gold toning bath.

Salt Bath.

A short immersion of prints in the following bath prior to the first washing favours even toning and prevents spots and stains from rusty tap water :—

Salt	2 ozs. (100 gms.)
Sodium carbonate, cryst.	1 oz. (50 gms.)
Water, to ...	20 ozs. (1,000 c.c.s.)

If prints are to be toned in the platinum bath the carbonate should be omitted.

Combined Baths.

VALENTA'S FORMULA.

Hypo	8 ozs. (400 gms.)
Ammonium sulphocyanide ...	1 oz. (50 gms.)
Lead nitrate ...	175 grs. (20 gms.)
Alum	350 grs. (40 gms.)
Water, to make	20 ozs. (1,000 c.c.s.)

Dissolve the hypo in the water, add the sulphocyanide, then add the alum dissolved in a little water, and also the lead, and add to the hypo. Heat the mixture to 120 deg. F. for ten minutes; allow to cool. For use take—

Stock solution ... (as above)	10 ozs. (100 c.c.s.)
Water	10 ozs. (100 c.c.s.)
Gold chloride ... (from stock sol.)	3½ grs. (0·08 gm.)

H. W. BENNETT'S FORMULA.

A serious objection frequently urged against combined toning and fixing is that prints may reach the desired tone before they are completely fixed, and, in that case, deterioration is inevitable. A further objection is that, with a bath compounded for repeated use, toning may continue after the gold in the solution is exhausted, and fugitive prints will result.

These two weak points in combined toning and fixing are removed by adopting the following formula. Sufficient solution for the prints in hand is compounded from the following stock solutions, used once only and thrown away. The minimum time for combined toning and fixing in this bath is twelve minutes.

Five stock solutions are prepared, each of which will keep indefinitely. The feature of this bath is that equal quantities of each bath are taken, excepting that for each c.c. of B, C, D and E, 10 c.c.s. of A are taken, and the bath is ready for use within five minutes of mixing. No calculation is necessary whatever quantity of bath is required.

A.	Hypo ...	400 gms.
	Water, to	1,000 c.c.s.
B.	Ammonium sulphocyanide	240 gms.
	Water, to	1,000 c.c.s.
C.	Lead acetate	120 gms.
	Boiling water	1,000 c.c.s.
D.	Gold chloride	1 gm.
	Water, to	83 c.c.s.
E.	Strongest ammonia	100 c.c.s.
	Water, to	1,000 c.c.s.

For use take: 40 c.c.s. A. 4 c.c.s. B, 4 c.c.s. C, 60 c.c.s. water, 4 c.c.s. D and 4 c.c.s. E. The measure must be well rinsed after measuring C and D. The mixing appears complicated in the description; in use it is simple. For each 10 c.c.s. of A, 1 c.c. of each of the other solutions is required, the quantity being determined by the number of prints to be toned, and the water added after the C solution being 1½ times the quantity of A.

40 c.c.s. of A will be sufficient for a print 8 × 6 ins., or 20 × 15 cms., and these quantities should be followed according to the number of prints to be toned. No preliminary washing is necessary.

Reducer for P.O.P. Prints.

The best reducer for over-printed P.O.P. prints is made at

the time of use from 10 per cent. stock solutions of (A) ammonium sulphocyanide and (B) potassium ferricyanide. The reducing solution consists of :—

A solution ...	10 parts.
B solution ...	1 part.
Water, to make	50 parts.

This is used on the prints after toning, fixing and well washing out the hypo in the usual way.

This reducer acts perfectly on P.O.P. prints, even after gold toning. If anything, it improves the tone of the print by rendering it somewhat cooler.

Platinum Toning.

PHOSPHORIC ACID.

Potassium chloro-platinite	4 grs. (0·45 gm.)
Phosphoric acid (sp. gr. 1·12)	¾ oz. (fl.) (37·5 c.c.s.)
Water, to make...	20 ozs. (1,000 c.c.s.)

CITRIC ACID.

Potassium chloro-platinite	4 grs. (0·45 gm.)
Sodium chloride (common salt)	40 grs. (4·5 gms.)
Citric acid ...	50 grs. (5·7 gms.)
Water, to make...	20 ozs. (1,000 c.c.s.)

HADDON'S FORMULA.

Platinum per-chloride	1¾ grs. (0·2 gm.)
Sodium formate	57 grs. (6·5 gms.)
Formic acid ...	17 minims (1·7 c.c.)
Water, to make...	20 ozs. (1,000 c.c.s.)

STOP FOR PLATINUM TONING.

A weak solution of sodium carbonate (10 grs. per oz. or 20 gms. per litre) instantly arrests the toning action of a platinum bath.

BROMIDE, CHLORO-BROMIDE AND GASLIGHT PAPERS.

Amidol Developer.

Sodium sulphite cryst.	240 grs. (55 gms.)
Potassium bromide	6 grs. (1·4 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

When dissolved add—

Amidol	24 grs. (5·5 gms.)

For stronger prints the water may be reduced to 8 ozs. and 800 c.c.s. respectively.

For gaslight paper the bromide should be reduced to 1·5 grs. (0·35 gm.). This smaller quantity of bromide may be used for bromide prints that are not intended for toning, as it produces a colder black. For prints intended for toning the quantity of bromide specified in the formula must be used.

This developer will not keep in good condition for more than 2 days.

Metol-Hydroquinone.

One solution.

Metol	5 grs. (1·15 gms.)
Sodium sulphite cryst.	160 grs. (37 gms.)
Hydroquinone ...	15 grs. (3 5 gms.)
Sodium carbonate cryst.	160 grs. (37 gms.)
Potassium bromide	5 grs. (1·15 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

For gaslight prints the bromide should be reduced to 1·5 grs. (0·35 gm.). See Note on Amidol developer.

Dissolve the chemicals in warm water and use when cold.

The instructions for dissolving metol in the developers for negatives should be carefully noted.

This developer will remain in good working condition for several weeks in well-corked bottles filled to the neck. It may be used so long as it remains clear and colourless.

Two-solution.

No. 1.

Sodium sulphite cryst.	480 grs. (110 gms.)
Potassium meta-bisulphite	80 grs. (18·3 gms.)
Metol	20 grs. (4·6 gms.)
Hydroquinone ...	60 grs. (14 gms.)
Potassium bromide	20 grs. (4·6 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

No. 2.

Sodium carbonate cryst.	640 grs. (147 gms.)
Water, to make	10 ozs. 1,000 c.c.s.)

For gaslight prints the bromide should be reduced to 5 grs. (1·15 gms.). See note on Amidol developer.

These solutions will keep for a very long time in well-corked bottles, even if the bottles are only partially full.

For use, take No. 1, 1 part; No. 2, 1 part; water, 2 parts.

Chlorquinol.

(*For Chloro-bromide Papers.*)

Sodium sulphite cryst.	½ oz. (50 gms.)
Sodium carbonate cryst.	½ oz. (50 gms.)
Potassium bromide	8 grs. (1·8 gms.)
Chlorquinol ...	30 grs. (7 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

Time of development, 2 to 3 minutes at 65° F. For warmer tones, dilute with an equal bulk of water, increase the exposure, and add more bromide.

If this developer is prepared in two solutions it has much better keeping qualities.

A.	Sodium sulphite, cryst.	1 oz. (100 gms.)
	Chlorquinol ...	60 grs. (13·7 gms.)
	Potassium bromide	15 grs. (3·5 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)
B.	Sodium carbonate, cryst.	1 oz. (100 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)

For brown-black tones mix equal parts of A and B. For warmer tones, increase the exposure, take 1 part A, 1 part B, 2 to 6 parts of water, according to the tone desired, and add more bromide.

Stress Marks on Bromides.

If stress marks occur, they can usually be removed by gently rubbing each print with a soft rag as soon as it has had a minute or so in the wash-water.

An alternative method is to rub the surface of the print with a piece of soft rag moistened with methylated spirit when dry.

Sulphide Toning.

Of the many methods of producing warm brown tones on bromide prints the following is the best and most reliable. The prints are bleached in a bath of ferricyanide and bromide, briefly washed, and darkened or toned in a solution of sodium sulphide. Prints require to be well washed from hypo before being put into the bleacher. In summer, or in places where the water supply has a softening action on prints, it is well to fix them in a fixing hardening bath. (See "Fixing.")

STOCK BLEACHING SOLUTION.

Potassium bromide	½ oz. (50 gms.)
Potassium ferricyanide	1 oz. (100 gms.)
Water, to make...	10 ozs. (1,000 c.c.s.)

This solution will keep indefinitely if protected from strong light. To prepare the working solution take 1 part stock and 9 parts water.

SULPHIDE BATH.

It is best to keep the sulphide in strong 20 per cent. solution; a weak solution does not keep well. Use the pure *white* sodium sulphide, dissolving 4 ozs. in water and making up to 20 ozs. with water (200 gms. per litre).

To make the working sulphide bath, mix :—

Stock 20% sulphide soln.	... 3 parts
Water, to make...	20 parts

The prints are treated for two or three minutes in the bleacher —that is, until the picture becomes faint brown in colour. If any black is left at the end of two minutes it is a sign that the bleacher (which may be used repeatedly) is becoming exhausted.

Rinse in clean water for half-a-minute to one minute. Longer washing at this stage does no good and may impair the tone.

Transfer to sulphide bath, where prints should darken to the full brown or sepia in 30 to 60 seconds.

Throw away the sulphide bath after the day's use. Stale spoilt sulphide solution is the most frequent cause of bad tones or of refusal of prints to darken in the sulphide bath.

Finally wash for half-an-hour in running water.

The results by the sulphide process are quite permanent.

Blue stains, in spots and patches, on sulphide-toned prints are due to iron, either as rust in the tap-water or as impurity in alum. Fit a flannel filter to the tap and use pure alum.

Dilute hydrochloric acid applied to the blue spots, after the print is thoroughly dry, will remove the spots without injury to the print. Washing is then necessary to remove the acid.

Sulphide-toned prints of bad colour or insufficient depth can be retreated, *e.g.*, by bleaching in :—copper bromide, 260 grs. (27 gms.); sodium bromide, 5 ozs. (222 gms.); water, 20 ozs. (1,000 c.c.s.). This is used in the dark room, the bleached print taken into daylight and re-

developed with amidol or other clean developer, after which it may be re-toned. Over-dark sulphide-toned prints of light subjects, *e.g.*, sketch portraits or enlargements which are afterwards to be worked up, may be reduced by putting back into the ferricyanide-bromide bleach after washing out the sulphide darkening bath.

Occasionally this method leads to staining of the whites a deep orange colour. This can be largely avoided by the use of a 5 per cent. bath of nitric acid for 5 minutes between bleaching and re-developing. Further improvement may be made by substituting for the above bleaching solution :—

Copper sulphate	20 grs. (4·6 gms.)
Potassium bromide	10 grs. (2·3 gms.)
Water	1 oz. (100 c.c.s.)

Bleaching is very slow, and may take 2 hours.

Silver-Mercury Sulphide.

(*H. W. Bennett's process.*)

By this process any colour from warm brown to brown black can be produced with certainty, provided that the development of the print has been full.

The bleaching bath is compounded from two stock solutions, according to the colour desired.

A.	Potassium ferricyanide	2 ozs. (100 gms.)
	Potassium bromide	1 oz. (50 gms.)
	Water, to make	20 ozs. (1,000 c.c.s.)
B.	Mercuric chloride	½ oz. (25 gms.)
	Water, to make	20 ozs. (1,000 c.c.s.)

To prepare the bleaching bath, take the following proportions of A and B, according to the colour desired.

A.	60 parts ...	Rich warm brown
A.	60 parts ...	Cool brown
B.	30 parts ...	
A.	40 parts ...	Very deep brown
B.	40 parts ...	
A.	40 parts ...	Brown-black
B.	80 parts ...	

Different proportions may be used for obtaining intermediate tones.

Whenever solution B is used in compounding the bleaching bath, a 1 per cent. (pure) hydrochloric acid bath must be used between bleaching and sulphiding.

After five minutes' washing from the bleaching solution, two or three changes of this acid bath must be given, and then a few minutes' washing before placing the prints in the ordinary sulphide bath described in the preceding formula.

When the bleaching bath contains a proportion of solution B the print is intensified as well as toned, the degree of strengthening depending on the proportion of B used. Allowance must be made for this in printing by decreasing the exposure, not by shortening the development. When the full quantity of the mercuric solution B is used, three-fourths of the normal exposure will be correct in making the print, which should be developed normally.

Hypo-Alum Toning.

The following is the method (much used on the commercial scale) for toning bromide and gaslight prints to a warm purplish sepia. Prints must be fixed in a hardening-fixing bath. They are then toned in a hot

mixture of hypo, alum, etc., made as follows :—

Hypo	1 lb. (400 gms.)
Hot water ...	80 ozs. (2,000 c.c.s.)

Dissolve, and then add—

Alum	3½ ozs. (87 gms.)

Stir well, boil for 2 or 3 minutes, cool to about 150° F. (65° C.) and then add the Silver Ripener, made as below :—

Stir well again and add :

Potassium iodide	40 grs. (2·3 gms.)

The whole mixture is thoroughly well stirred.

Silver Ripener.

Silver nitrate ...	20 grs. (1·3 gm.)
Water	1 oz. (30 c.c.s.)

To this add drop by drop, strong (·880) ammonia, until the precipitate first formed is just re-dissolved. Stir vigorously while adding the ammonia.

The toning bath can be used repeatedly, keeping up the bulk by occasional addition of fresh solution. The best results are obtained by keeping the bath hot, or as warm as the emulsion will stand, say 100° to 120° F. (38° to 50° C.). At this temperature prints will tone in from 20 to 30 minutes. The bath can be used cold, in which case toning takes about 24 hours, the prints requiring to be turned over every little while.

After using the hot bath, it is well, after toning, to pass the prints through a solution of :

Alum	250 grs. (30 gms.)
Water	20 ozs. (1,000 c.c.s.)

Prints are finally washed thoroughly in water.

Liver of Sulphur Toning.

Liver of sulphur	15 grs. (1·7 gms)
Water	20 ozs. (1,000 c.c.s.)

This bath is used at about 80 deg. F., and tones in about 30 minutes, yielding results very similar to those with hypo-alum. Commercial papers are not, however, all equally suitable for "liver" toning.

Nitro-Sulphide Toning.

(*W. B. Shaw's Process.*)

This process is based on the fact that sulphide solutions with a suitable oxidising agent tone directly, thus obviating the necessity for an intermediate bleaching bath.

The nitro-sulphide process will yield more pleasing results on "gaslight" papers than the bleach and sulphide method, the colours resembling those obtained by hypo-alum toning.

Stock solutions :

Solution A.

A saturated solution of barium sulphide. To prepare this, ¼ oz. (12·5 gms.) of barium sulphide is shaken up with 20 ozs. (1 litre) of warm water and the undissolved portion allowed to settle. The clear liquid is poured off for use. The bottle must be kept tightly closed.

Solution B.

A 10 per cent. solution of sodium meta-nitro-benzene sulphonate.

For use take : A. 4 ozs (100 c.c.s.) and B. 2 drams (6 c.c.s.).

The best results are obtained by giving prints a generous exposure and developing with

M.Q. The final tones vary considerably with different brands of paper, ranging from purple to warm brown. As the progress of toning is under direct observation, intermediate colours can be secured with ease.

With slow bromide and chlorobromide papers toning may be too rapid for convenient control. In such cases, the solution should be largely diluted with water.

If toning is carried to completion, fast contrasty papers usually give cold tones and slow normal papers warm ones.

The temperature of the toning bath should not be below 60° F. (16° C.).

Prints for this process need not be completely washed after fixing, but it is just as well to wash for a few minutes before toning.

Copper Toning.

A. Copper sulphate		60 grs. (7 gms.)
Potassium citrate (neutral salt)		240 grs. (28 gms.)
Water to	...	20 ozs. (1,000 c.c.s.)
B. Potassium ferricyanide		50 grs. (6 gms.)
Potassium citrate		240 grs. (28 gms.)
Water to	...	20 ozs. (1,000 c.c.s.)

Use equal parts of each. If prints are pinkish in the highlights use more citrate in the A or B solution.

The copper toning process gives a range of tones from warm brown to bright red, according to the time of action of the solution. Toned prints last fairly well but are inferior in permanence to those made by the sulphide-toning method. The toning has scarcely any perceptible effect on the depth of prints.

In this mixture which must be used soon after making, prints gradually tone and pass through the stages of purplish black and brown to a decided red. Prints should be well washed from hypo before toning.

Uranium Toning.

This old method yields brown to reddish tones. It intensifies the prints, but the results often prove impermanent.

A. Uranium nitrate		90 grs. (10 gms.)
Water ...	...	20 ozs. (1,000 c.c.s.)
B. Potass. ferricyanide		90 grs. (10 gms.)
Water ...	...	20 ozs. (1,000 c.c.s.)

Use equal parts of A and B and add 20 minims of glacial acetic acid to each ounce of mixture (40 c.c.s. per litre). The prints must be free from hypo. After toning wash in several changes of *still* water till the high-lights are clear. Washing in running water will remove the toning in patches. Citric acid (10 grs. per oz.—23 gms. per litre) or oxalic acid (5 grs. per oz. —11 gms. per litre) instead of acetic is an aid to pure whites.

As a means of rendering uranium-toned prints permanent it is recommended to fix the toned prints for five minutes in hypo, ½ oz. (25 gms.); potassium metabisulphite, 70 grs. (8 gms.); water, 20 ozs. (1,000 c.c.s.).

Blue Tones

A.	Potassium ferricyanide	15 grs. (1·7 gms.)
	Sulphuric acid, conc.	30 minims (3 c.c.s.)
	Water	20 ozs. (1,000 c.c.s.)
B.	Ferric ammonia citrate	15 grs. (1·7 gms.)
	Sulphuric acid, conc.	30 minims (3 c.c.s.)
	Water	20 ozs. (1,000 c.c.s.)

Mix equal parts of A and B at time of use. Prints should be light, as the toning also intensifies. When toned, wash to remove all yellow colour.

Green Tones.

A.	Potassium ferricyanide	180 grs. (2 gms.)
	Water, distilled	20 ozs. (100 c.c.s.)
B.	Vanadium ... chloride stock soln.	3¼ drs. (4 c.c.s.)
	Ferric ammonia citrate (*green*)	45 grs. (1 gm.)
	Sodium citrate neutral	2½ ozs. (25 gms.)
	Ammonium chloride	90 grs. (2 gms.)
	Hydrochloric acid	1½ ozs. (14 c.c.s.)
	Water, distilled	10 ozs. (100 c.c.s.)

The hydrochloric acid is the "pure strong" of 1·16 sp. gr.

The stock vanadium solution is made by mixing 1 oz. of vanadium chloride, as purchased (Merck's syrupy), with 5 drams (18 c.c.s.) of strong hydrochloric acid and then adding distilled water to make 2 ozs. 90 minims (62 c.c.s.) in all.

In making up the B solution first add the hydrochloric acid to the vanadium solution. Then dissolve the ferric citrate, soda citrate, and ammonium chloride in 100 c.c.s. water and mix the two. Solution should be dull mauve blue; not green—until mixed with A.

Both A and B solutions will keep for months at least.

To mix the toning solution, take 1 part A with 4 parts water, and separately, 1 part B with 4 parts water. The two weak solutions when mixed together form the toner.

Prints tone in from 4 to 8 minutes. Rock constantly, then wash in 5 changes of water, each of 2 minutes, give a bath of hydrochloric acid (1 part in 50 parts water) for 2 minutes, and finally wash for 15 minutes in 7 or 8 changes of water.

Prints should be of the ordinary depth. The green tone is permanent.

Gold Toning.

For improving the colour of greenish or rusty black prints, and for bluish tones.

Ammonium sulphocyanide	130 grs. (15 gms.)
Chloride of gold	9 grs. (1 gm.)
Boiling water ...	20 ozs. (1,000 c.c.s.)

Use as soon as cool. Place the wet print face upwards on a sheet of glass, squeegee into contact, blot off superfluous moisture, and paint the above bath on with a broad flat brush; when the desired tone is reached wash well and dry.

Glazing Prints.

GLAZING SOLUTION.
(*For Gelatine Prints only.*)

In glazing prints by stripping from glass plates or ferrotype sheets, the best means for avoidance of sticking of prints is the use of a so-called "glazing" or "stripping" solu-

tion. In the use of rotary drying-glazing machines, a glazing solution may be of advantage in dealing with prints on a paper which does not strip easily. The glazing solution may be bought ready made or prepared from :—

Ox-gall, prepared	1 oz. (12 c.c.s.)
Water	80-160 ozs. (1,000 to 2,000 c.c.s.)

The prints are soaked in this solution for a minute or two and laid on the glasses without intermediate washing.

Those who do not object to the mess (and smell), may prepare ox-gall by buying gall-bladders from a butcher or slaughter-house, and mixing the fluid from a bladder with formalin in the proportion of about 2 ozs. formalin per gallon or gall. (12·5 c.c.s. per litre). The mixture is filtered through several thicknesses of butter muslin, after which it is bottled and will keep for a long time.

A polishing medium to be applied to glass or ferrotype before squeegeeing the print is—

Beeswax ...	20 grs. (45 gms.)
Turpentine ... or	1 oz. (1,000 c.c.s.)
Spermaceti wax	20 grs. (45 gms.)
Benzole	1 oz. (1,000 c.c.s.)

a few drops of which are rubbed on with a piece of flannel, and the glass afterwards polished with silk rag or chamois leather.

ENAMEL COLLODION.

(For Glazing both Gelatine and Collodion Prints.)

Glass plates cleaned with French chalk are coated with the following solution :—

Soluble gun cotton ...	125 grs. (14 gms.)
Alcohol	10 ozs. (500 c.c.s.)
Sulphuric ether	10 ozs. (500 c.c.s.)

and, as soon as coating has set, slipped under prints which are waiting face down in water. Prints are withdrawn and squeegeed. When they are half dry, a stout backing paper is pasted on with good thick photo-mountant, and the prints then allowed to dry. The object of the backing paper is to prevent penetration of moisture when the prints are mounted. They are finally stripped off.

Ink Drawings from Prints.

The following process can be used with prints on bromide or gaslight paper or P.O.P.

After outlining the subject in waterproof Indian ink, bleach out the image in—

Thiocarbamide ...	240 grs. (27·5 gms.)
Nitric acid ...	4 drs. (fl.) (25 c.c.s.)
Water to ...	20 ozs. (1,000 c.c.s.)

Or the following bleaching solution may be used :—

Iodine solution ...	30 minims (6 c.c.s.)
Potassium cyanide solution	5 minims (1 c.c.)
Water to ...	1 oz. (100 c.c.s.)

The iodine and cyanide solutions are each of 10 per cent. strength. The iodine is dissolved with the aid of potassium iodide ; the cyanide in plain water.

THE CARBON PROCESS.

Procedure.—Tissue, *i.e.*, paper coated with a mixture of gelatine and pigment colour, is made sensitive by immersion in bichromate solution, dried, and printed under the negative by daylight. As the colour of the tissue hides the effect of light, the printing is done by aid of an actinometer.

The effect of the light is to render the gelatine insoluble—the greater the action, the deeper down into the tissue. "Development" consists in dissolving out in warm water the tissue which remains soluble.

As a skin of insoluble tissue is formed over the whole top surface of the print, the coating is first transferred, face down, on to a fresh support.

To do this, the exposed tissue is soaked in cold water along with a sheet of gelatine-coated transfer paper, the two squeegeed together, put under pressure for about 20 minutes, and then placed in hot water.

The original support of the sensitive surface is stripped off, leaving the tissue with its face (the insoluble side) on the transfer paper. The soluble gelatine can be then dissolved away, carrying the pigment with it, and the prints are finally passed through an alum bath, washed and dried.

As this transference of the print to a new support causes the picture to appear reversed as regards right and left, it is necessary (where this is an objection) to transfer first on to a "temporary support" for development, and from this again on to the "final support."

Sensitising Solutions.

Potassium bichromate		½ oz. (50 gms.)
Water	... ...	10-20 ozs. (1000 to 2000 c.c.s.)
Liquor ammonia, 0·880		30 minims (7 c.c.s.)

If the tissue be squeegeed on to a ferrotype plate, and allowed to dry upon it, the drying may be done in the light of an ordinary room. The face of the tissue is then protected from light, dust, and injurious vapours.

FIXING OR HARDENING BATH.

Alum	... ...	½ oz. (50 gms.)
Water to	...	10 ozs. (1,000 c.c.s.)

H. W. Bennett's formula :—

Potassium bichromate		120 grs. (28 gms.)
Citric acid	...	30 grs. (7 gms.)
Water to	...	10 ozs. (1,000 c.c.s.)

To this, add liquor ammonia sufficient to change the orange-red colour to lemon yellow.

This bath is suitable for negatives which will yield good prints in contact bromide printing. Tissue sensitised in it will keep longer than that sensitised in the former solution, but it is much less sensitive. It is not suited for the very strong negatives usual in carbon printing.

Bichromate Stains, Etc.

To remove bichromate stains from fingers, nails, etc., apply dilute ammonia to the parts until the stains disappear, then well wash the hands with warm water and soap.

Waxing Solutions.

No. 1 formula is for carbon prints or for removing collodion films.

1. Beeswax ...	50 grs. (11·5 gms.)
Benzole rect. No. 1	10 ozs. (1,000 c.c.s.)

No. 2 formula is for flexible supports.

2. Yellow resin	180 grs. (41 gms.)
Yellow beeswax	60 grs. (13·7 gms.)
Rect. spirit of turpentine ...	10 ozs. (1,000 c.c.s.)

Carbon Transparencies.

The following is a substratum for use in making carbon transparencies.

Nelson's No. 1 gelatine	¾ oz. (37·5 gms.)
Water to ...	20 ozs. (1,000 c.c.s.)
Potassium bichromate	12 grs. (1·37 gms.)

Well cleaned plates are coated with this and dried, when they are fully exposed to light, which will render the coating insoluble.

Gelatine Solutions.

For transferring carbon pictures from flexible support to vory, opal glass, &c.

Nelson's No. 1 gelatine ...	½ oz. (50 gms.)
Water to ...	10 ozs. (1,000 c.c.s.
Chrome alum ...	6 grs. (1·37 gms.)

The chrome alum is previously dissolved in 1 oz. (100 c.c.s.) of water and the solution added to that of the gelatine.

For coating drawing-papers for the single transfer process

Nelson's No. 1 gelatine	½ oz. (50 gms.)
Water to ...	10 ozs. (1,000 c.c.s.)
Chrome alum ...	10 grs. (2·3 gms.)

Apply with a brush.

The chrome alum is previously dissolved in 1 oz. (100 c.c.s.) of water and the solution added to that of the gelatine.

In adding a solution of chrome alum to one of gelatine, both solutions should be at a fairly high temperature, 130° to 160°F.

THE CARBRO PROCESS.

In this process a carbon print is made from a bromide print or enlargement without the aid of daylight.

A good bromide print must first be prepared, care being necessary to ensure correct exposure and full development. Weak, flat bromides give unsatisfactory results.

The print, which has been thoroughly washed and dried, is placed in a dish of clean water, and should remain in this until quite limp or until required.

The following solutions are required :—

STOCK SOLUTION No. 1.

(For making Sensitising Bath.)

Potassium bichromate	½ oz. (50 gms.)
Potassium ferricyanide	½ oz. (50 gms.)
Potassium bromide	½ oz. (50 gms.)
Water to	10 ozs. (1,000 c.c.s.)

Sensitising Bath for Use.

Stock solution No. 1	6 ozs. (100 c.c.s.)
Water	18 ozs. (300 c.c.s.)

This bath may be used repeatedly, but should be strained through fine muslin or cotton wool after use.

STOCK SOLUTION No. 2.

(For Acid-Formalin Bath.)

Acetic acid, glacial	1 oz. (10 c.c.s.)
Hydrochloric acid, pure	1 oz. (10 c.c.s.)
Formalin	22 ozs. (220 c.c.s.)
Water	1½ ozs. (15 c.c.s.)

The formalin is the commercial 40 per cent. solution of formaldehyde.

Acid-Formalin Bath for Use.

Stock solution No. 2	1 oz. (10 c.c.s.
Water	32 ozs. (320 c.c.s.)

Renew this bath frequently as contamination with "sensitiser" lessens its activity.

A piece of carbon tissue of the required size, which must be about ¼ in. larger each way than the bromide print, is "sensitised" by immersion for three minutes in the "sensitising bath" given above containing potassium bichromate, ferricyanide and bromide.

During this time the bromide print should be removed from the water and laid face upwards on a sheet of stout glass.

When the tissue has been in the "sensitising" bath for the requisite time it is removed, and allowed to drain for 15 seconds. It is then placed in the acid-formalin bath. The time of immersion in this solution varies according to the brilliancy desired in the resulting print, and may be from 15 to 25 seconds, the longer immersion giving greater softness.

The tissue is now laid face downwards upon the bromide print, and the two squeegeed into contact. A flat squeegee is used, and particular care taken that the tissue does not move on the surface of the bromide during the early stages of squeegeeing.

Both print and tissue are now lifted from the glass, and placed between greaseproof paper, where they are allowed to remain for 15 minutes. During this time a piece of transfer paper, similar to that used in carbon printing and larger in size than the tissue in use, is selected and placed in a dish of water.

If a thin transfer paper is used, allow it to soak for 5 minutes, while, if thick, 10 minutes will be necessary.

The transfer paper is then laid face upwards upon a sheet of glass, and is ready to receive the carbon tissue.

The bromide print and its adhering tissue should now be taken from between the greaseproof paper, and the two carefully separated by lifting one corner of the print and gently but decisively pulling the two

surfaces apart. The bromide print should be dropped into a dish of water, and the tissue placed film down upon the transfer paper.

The tissue is then squeegeed to the support transfer paper, and the two placed between blotting paper for from 20 to 40 minutes. The bromide print, after well washing, may be re-developed for future use.

When the tissue and final support have been in contact for the required time they are placed in a deep dish of water at a temperature of 95° to 100° F. In a few minutes the pigmented gelatine begins to dissolve: colour oozes out at the edges of the tissue.

The two papers are now separated by taking a corner of the tissue and gently pulling the two apart under the water. The majority of the pigmented gelatine will now be found upon the transfer paper, and development of the image is proceeded with by pouring warm water over the surface of the print. The image is very tender at this stage, and care should be taken that nothing touches its surface. When development is complete the print is transferred to a 3 per cent. solution of alum, and when all signs of yellowness in the high-lights have disappeared, is washed for a few minutes in water, and then hung up to dry.

THE OIL PROCESS.

Gelatine-coated paper is sensitised with bichromate, printed under the negative, and treated in cold water. The faint image has the power of fixing greasy ink.

SPIRIT SENSITISER (*Demachy*).

Prepare 6 per cent. ammonium bichromate stock solution by dissolving 1½ ozs. of this salt in 25 ozs. of water.

To make the sensitiser mix at time of use:—

Stock bichromate solution	1 part.
Alcohol, pure 90°	2 parts.

The sensitiser is applied with a flat hog-hair brush, about ¾ oz. (25 c.c.s.) serving for six 10×8 sheets of transfer paper.

The paper dries in about 18 minutes, and is printed under the negative until it shows a brown image as in the platinum printing process. The detail should show in the high-lights.

It is then soaked in several changes of water to remove the yellow bichromate (about 20 minutes), and then soaked for a further time (in a dish of water), depending on the thickness of the gelatine coating. An average time is 30 minutes; 2 to 3 hours, for more heavily coated papers. The temperature of the water should be between 65° and 70° F.

The print can be pigmented forthwith, or dried for pigmenting later on. If it is dried it requires about an hour's soaking in water at 65° to 70° F. to bring it into the best condition for pigmenting.

THE BROMOIL PROCESS.

In this form of the oil process a bromide print or enlargement is treated so as to bleach the image and at the same time bring the print into a condition similar to that produced by exposure of sensitised paper in the oil process.

The bleach is made from the two following stock solutions :—

A.	Copper chloride	160 grs. (36·6 gms.)
	Sodium chloride (common salt)	2oz. 290 grs. (266 gms.)
	Hydrochloric acid	3 minims (0·6 c.c.)
	Water ...	10 ozs. (1,000 c.c.s.)
B.	Potassium bichromate	55 grs. (12·5 gms.)
	Water ...	10 ozs. (1,000 c.c.s.)

The bleach is made up by mixing 1 part of A, 1 part of B, and 2 parts of water.

The bromide print is soaked in water for about 5 minutes until limp, drained from surface moisture and placed in the bleacher. Within from 3½ to 4½ minutes the picture is converted into a faint brownish image. When thus fully bleached the print is washed in running water for about 15 minutes to free it from yellow stain and is then fixed in a hypo bath containing 1 oz. of hypo in 20 ozs. of water (50 gms. per litre). It is then again washed for about half an hour.

Before pigmenting the print is soaked in warm water, the temperature of this water requiring to be adjusted to the quality of the bromide paper. Average temperatures are those from 70 to 80° F. (21-27° C.). The print is soaked for a time which may range from 15 to 45 minutes and is then ready for pigmenting.

Separate Bleaching.

Venn Method.

Bromide prints, developed to a Watkins factor of 8 in the maker's amidol developer, used at half strength, are transferred directly after draining to a 10 per cent. hypo solution for 5 minutes. They are then thoroughly washed and dried.

After soaking for 5 minutes, the print is bleached in :—

Copper sulphate (10% soln.)	95 parts
Potassium bromide (10% soln.)	5 parts

After remaining here half a minute after the bleaching appears complete, the print is drained and put directly in :—

Potassium bromide (10%)	4 ozs. (200 c.c.s.)
Potassium bichromate (1%)	2 ozs. (100 c.c.s.)
Water, to make	20 ozs. (1,000 c.c.s.)

for four minutes.

After washing for five minutes in several changes of water, it is fixed for two minutes in 10 per cent. hypo, washed for fifteen minutes in one or two changes of water and dried. A temperature of 60-65° F. (15·5-18° C.) should be maintained through these operations.

Before inking up, the dried prints are soaked for times ranging from 30 to 45 minutes.

To dry a Bromoil quickly, soak in methylated spirit and hang up.

PALLADIOTYPE.

In the Palladiotype process, which was introduced some years ago by the Platinotype Company, the stable metal palladium replaces platinum. With the exception that the solutions employed are different from those used for Platinotype the procedure is exactly the same. Palladiotypes afford by cold development rich warm-black prints, free from double tones, or inclination to greenish hue, and closely resemble Platinotype prints.

DEVELOPER.

Sodium citrate		$1\frac{3}{4}$ ozs. (175 gms.)
Citric acid	...	48 grs. (11 gms.)
Water	... ...	10 ozs. (1,000 c.c.s.)

To be used without dilution at 65° to 70° F. (18° to 21° C).

The prints should be developed as soon after printing as feasible and, at least, one minute allowed for full development. They are then transferred direct to the first clearing bath.

The addition of small quantities of potassium bichromate to the developer gives added contrast without loss of quality. From one grain to 4 grains to 20 ozs. (0·1 – 0·4 gms. per litre) may be used according to the effect desired. Printing should be slightly longer than the normal.

CLEARING BATH.

Stock Solution.

Sodium citrate		960 grs. (220 gms.)
Citric acid	...	422 grs. (97 gms.)
Water	... ...	10 ozs. (1,000 c.c.s.)

For use mix one part of stock solution with 7 parts of water.

Three baths are required, the times of immersion being not less than 5, 10 and 20 minutes respectively. These periods may be prolonged, within reason, without detriment. The prints are then washed for not less than 20 minutes in several changes of water and suspended to dry.

PLATINUM PRINTING.

In the platinum process the paper is coated with a sensitive iron (ferric) salt, and a salt of platinum. On exposure to daylight, or equivalent, the iron salt is reduced to the ferrous state, the change being accompanied by a darkening which enables the depth of printing to be judged. Printing should be continued until all details except in the highest lights, are visible in the preliminary image.

Development is done by either floating on, or immersing in, a solution the principal ingredient of which is potassium

oxalate. The ferrous salt is soluble in this solution, and in the act of dissolving reduces the platinum salt *in situ* in extent corresponding with the reduction of the ferric salt by light, the permanent picture in finely divided platinum appearing simultaneously. To secure the full beauty of the process, correct exposure and full development are essential. Correctly exposed prints cannot be over-developed; the action automatically ceases when all the ferrous salt has been dissolved. Not less than one minute should be allowed for cold development; with hot solutions a few seconds suffice.

No fixing is required, but to eliminate iron and other salts remaining after development, the prints must first be washed in dilute hydrochloric acid solution. This is the operation known as "clearing." The acid is essential, for if omitted basic compounds will form and the paper will discolour with age. Accordingly, the prints are transferred direct from the developer to the first clearing bath, in which they should remain for about 5 minutes. They are then removed to a second bath for 10 minutes and again to a third bath for about 15 minutes.

The clearing solution for "black" prints should contain 1 oz. of pure hydrochloric acid to 60 ozs. of water (16·5 c.c.s. per litre) for "sepia"* papers the quantity of water may be increased to 80 ozs. (1,350 c.c.s.) with advantage.

After clearing, the prints are washed for about 15 minutes (four or five changes of water are sufficient) and suspended to dry. Drying between blotters is a frequent cause of stains.

The following are the developers recommended by the Platinotype Company, the original patentees and manufacturers of the papers. Purity of the chemicals is of the utmost importance. Those supplied by the Company are tested, and can be relied upon.

Cold-Bath Developer.

To be used for all grades of "Black" Platinotype paper at a temperature of 65° to 70° F. (18° to 21° C.).

Stock Solution.

Potass. oxalate...	640 grs. (140 gms.)
Potass. biphosphate	91 grs. (20 gms.)
Oxalic acid ...	23 grs. (5 gms.)
Water	10 ozs. (1,000 c.c.s.)

For use dilute with equal bulk of water.

Hot-Bath Developer.

To be used for Sepia Japine Papers only, at temperature 160° to 170° F. (71° to 77° C.).

Formula for Stock Solution as the foregoing, but with water reduced to 8 ozs. (800 c.c.s.).

For use dilute with equal bulk of water.

To be used for matt-surface Sepia papers at temperature 160° to 170° F. (71° to 77° C.).

Potassium oxalate	2½ ozs. (250 gms.)
Oxalic acid ...	31 grs. (7 gms.)
Water	10 ozs (1,000 c.c.s.)

To be used without dilution.

During heating and when not in use the hot-bath developers should be kept covered with a sheet of glass, cut only a shade larger than the top of the dish.

IRON PRINTING PROCESSES.

Ferro-Prussiate Sensitiser.

The following is a sensitising solution for paper to be used for printing by daylight and to be kept in good condition for a considerable time (months) :—

A. Ferric ammonium citrate (green)	2½ ozs. (250 gms.)
Water to make	10 ozs. (1,000 c.c.s.)
B. Potassium ferricyanide	400 grs. (92 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

Mix in equal parts, keep in the dark, and filter just before use.

If the ordinary brown citrate be used, the formula should contain 820 grs. (187 gms.), and the ferricyanide should be increased to 600 grs. (137 gms.).

The sensitiser is applied with a brush or sponge. The paper is printed until the shadows bronze, and is "developed" simply by soaking in one or two changes of plain water.

The following is a sensitising solution yielding a very much more rapid paper but of inferior keeping qualities, *i.e.* keeping in condition for about 60 days :—

Ferric ammonium citrate, 26% solution ...	6 parts.
Ferric ammonium oxalate 10% solution ...	2 „
Ferric sodium oxalate, 10% solution ...	2 „
Ferric chloride, 7% solution	2 „
Oxalic acid, 10% solution	2 „
Potassium ferricyanide, 10% solution	1 part.

Solution for Writing Titles on, removing blue lines from blue prints, etc.—Potassium oxalate, 75 grs. per oz.; 170 gms. per 1,000 c.c.s.

Brightening the Colour.—Blue prints are improved in colour by a final bath of 2½ per cent. alum solution, 3 per cent. oxalic acid or 1 per cent. hydrochloric acid.

Pellet Process.

The Pellet process is for copies of line drawings only. From an ordinary tracing it gives a copy in blue lines on a white ground.

A. Pure gum arabic	2 ozs. (200 gms.)
Water	10 ozs. (1,000 c.c.s.)
B. Ferric ammonium citrate	5 ozs. (500 gms.)
Water	10 ozs. (1,000 c.c.s.)
C. Ferric chloride (crystallised)	5 ozs. (500 gms.)
Water	10 ozs. (1,000 c.c.s.)

Add 8 vols. of B, then 5 vols. of C to 20 vols. of A, in small doses with constant stirring.

The prints are developed on 10 per cent. solution of potassium ferrocyanide and "fixed" in 1 : 25 sulphuric acid (specific gravity 1·84).

Ferro-Gallic Process.

This process is for line drawings only. It gives a copy in bluish-black lines on a white ground from an ordinary tracing.

Gum arabic ...	600 grs. (137 gms.)
Warm water ...	10 ozs. (1,000 c.c.)

When dissolved add the following in the order given :—

Tartaric acid ...	80 grs. (18 gms.)
Salt	360 grs. 82 gms.)
Ferric sulphate	400 grs. (91 gms.)
Ferric chloride ...	600 grs. (137 gms.)

The developer for the prints is :—Alum and gallic acid, 1 part of each ; water 80 parts.

MOUNTANTS.

Starch Paste.

Mix pure starch powder with a very small proportion of cold water to form a very stiff mass. It should be so stiff that it is stirred with difficulty.

Perfectly boiling water is then poured in, about 12 ozs. for every ounce (12 c.c.s. per gram) of starch.

On stirring, the mixture will jellify without being boiled ; but if it does not it is brought to the boil, cooled, the skin taken off, and the paste used on day of making.

Dextrine Paste.

Dextrine, best white ...	13¾ ozs. (687 gms.)
Water at 160° F.	20 ozs. (1,000 c.c.s.)
Oil of wintergreen	5 minims (0·5 c.c.)
Oil of cloves ...	5 minims (0·5 c.c.)

Place the water in a vessel standing in a larger vessel of water kept to within 1° of 160° F. Stir in the dextrine slowly, and when it has all dissolved add the two preservative oils, stirring all the time Then allow to cool, pour into bottles, and cork. Put aside in a cool place for a week or two for the mixture to congeal to a firm white smooth paste.

Liquid Gelatine.

Gelatine	1 oz. (100 gms.)
Water	6 ozs. (600 c.c.s.)
Chloral hydrate ...	1 oz. (100 gms.)

The gelatine is dissolved in the water by aid of heat, and the chloral hydrate added. After digesting for a short time the adhesive liquid is neutralised with a little sodium carbonate solution.

Gelatine.

Nelson's No. 1 gelatine	4 ozs. (50 gms.)
Water	16 ozs. (200 c.c.s.)

Soften the gelatine in the water, liquefy on a water bath, and add (a little at a time and stirring rapidly) :—

Methylated spirit	5 ozs. (60 c.c.s.)
Glycerine... ...	1 oz. (12 c.c.s.)

The mountant is used hot. A piece of ground glass is dipped in hot water, drained, and the mountant brushed over it. The print is then laid face up on the frosted surface and rubbed gently in contact with a piece of paper, being then removed and pressed down on its mount.

Starch-Gelatine.

A. Bermuda arrow-root	8 ozs. (200 gms.)
Water	4 ozs. (100 c.c.s.)
B. Nelson's No. 1 soft gelatine	350 grs. (20 gms.)
Water	64 ozs. (1,600 c.c.s.)

The gelatine is first softened in the water, and A and B are then mixed together and boiled for a few minutes. To the cold mixture are stirred in—

Methylated spirit	5 ozs. (125 c.c.s.)
Carbolic acid (liquid) ...	25 minims (1·3 c.c.s.)

This is a good cold paste, which sticks and keeps fairly well.

Starch-Dextrine.

Water (cold) ...	5 ozs. (1,000 c.c.s.)
Starch	60 grs. (27 gms.)
Dextrine, best white	2 ozs. (400 gms.
Sodium carbonate, cryst	6 grs. (2·7 gms.)
Oil of cloves ...	8 minims. (3 c.c.s.)

The ingredients are dissolved and well mixed together in the order given, so as to form a milk-like fluid quite free from lumps. This is gradually brought to the boil (stirring all the time) and then poured into suitable jars, which it should nearly fill. When cool the surface skin is taken off and the jars well stoppered. In one or two days' time the mixture should have set to a smooth white paste, of excellent keeping quality. The sodium carbonate is required principally to neutralise any residual acid in the dextrine. Less than the quantity indicated may be found sufficient. When set, the paste should be either neutral or slightly alkaline to litmus paper.

Shellac Mountant.

A strong solution of shellac in methylated spirit, or better, rectified spirit, is thinly applied to both mount and print, and the two coated surfaces quickly rubbed into contact. This is a good method of fixing prints to thin mounts in albums, etc.

Fixing Paper to Metal.

Tragacanth ...	1 oz. (60 gms.)
Gum arabic ...	4 ozs. (240 gms.)
Water	16 ozs. (1,000 c.c.s.

Mounting on Glass.

Prints on gelatine printing paper may be mounted face down on glass with a solution of gelatine. (See below.) Prints mounted in this way were formerly largely sold as "opalines."

Nelson's No. 2 soft gelatine ...	1 oz. (30 gms.)
Water	10 ozs. (300 c.c.s.)

The gelatine is soaked in the water, and liquefied by standing the vessel in hot water. The solution is thinned down until nearly as thin as water. Print and glass are immersed, removed together, and squeegeed together.

Dry Mounting.

In this process a sheet of specially prepared dry mounting tissue paper is placed between the photograph and the mount and pressed together in a heated press. It is emphatically the best mounting method because it not only avoids stretch or distortion of a print and cockling of the mount, but also provides a waterproof protective skin between the print and the mount, thus preventing the possibility of any impurities in the mount attacking the photographic image.

Tissue is obtainable commercially in large sheets 24 × 20 ins., or in cut sizes. It is manufactured by impregnating tissue with shellac, gum, resin, etc., and requires a temperature of about 150° to 180°F., on the pressure plate to ensure perfect adhesion. The first operation consists of partially attaching a piece of tissue (slightly larger than the print) to the back of the print by stroking it locally with a heated metal fixing-iron

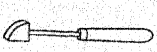


Fig. 1.



Fig. 2.

(figs. 1 and 2). The print with its tissue partially attached should then be trimmed together in a desk-trimmer (fig. 3), or by using a sheet of glass or zinc as a bedplate, a celluloid

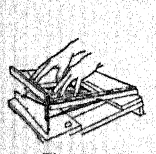


Fig. 3.

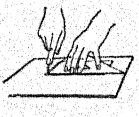


Fig. 4.

set-square as a straight-edge and a sharply pointed knife as a cutter (fig. 4). The trimmed print is placed in position on the mount, held firmly with the fingers of the left hand, lifting with the thumb one corner of the print only (not the tissue), and stroking the corner of the tissue with the hot fixing-iron (fig. 5). This operation is repeated near another corner in order to hold the print in position for pressing.

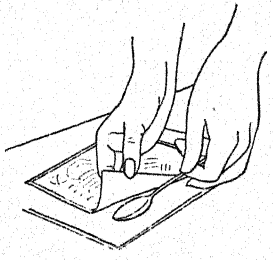


Fig. 5.

MOUNTING BY SPECIAL PRESS.

The mount, with its print loosely attached, is placed face up on a sliding cardboard carrier bed, a sheet of metal (called the cover plate) laid on top, the carrier slid under a special press heated to about 150° to 180° F., and pressure applied for a few seconds—from 5 to 20 seconds according to thickness of the print (fig. 6). The carrier

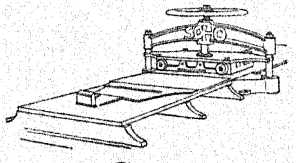


Fig. 6.

is then withdrawn, the mount picked up quickly and while

still hot should be bent slightly outwards, so that when cool there is no cockling (fig. 7).

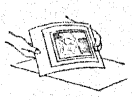


Fig. 7.

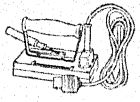


Fig. 8.

MOUNTING BY HAND IRON.

An electrically - heated domestic iron can be used as an alternative to the press, and is particularly suitable for amateur or occasional use. There is available a special box-shape mounting iron which has provision for inserting and heating the fixing iron. (fig. 8.)

The print is tissued, trimmed and " touched down " to the mount in the usual way, and a dry piece of plain paper a trifle larger than the picture is placed on top. The iron is then heated to 150° to 180°F., and drawn slowly across the surface of the paper with a firm pressing action (fig. 9). This should be

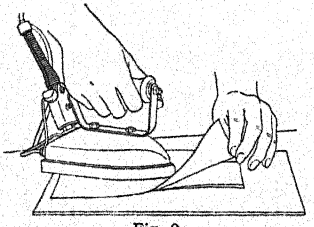


Fig. 9.

repeated several times until the print is evenly mounted. A sheet of thin metal, or an uncreased piece of aluminium foil can also be used as a " buffer " between the print and the mounting iron.

MOUNTING WITH BORDER TINTS.

A photograph can be dry-mounted on a plain mount showing a surround tint by " touching down " the tissued and trimmed print to a piece of paper of suitable colour which has already been tissued on the back. The tint is then trimmed all round, leaving the required border surround, touched down to the mount (see fig. 10), and

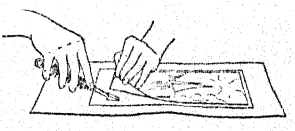


Fig. 10.

hot pressed all together, giving about double the time of " dwell " required for a singly-mounted print. Border paper tints of great variety of colour, coated on the back with dry-mounting adhesive, are obtainable commercially from all tissue manufacturers. Two or more border tints can be built up on a mount by the use of these tints.

If, after mounting, the tissue sticks to the mount but comes away from the print, the heat is too great. If the tissue sticks to the print, but not to the mount, it means that the pressing heat is insufficient or that the " dwell " time is not long enough. If the print sticks to the mounting cover-plate, it means that the print or mount contained moisture before mounting.

If, when mounting a print of the same size as the heating plate of the press, the corners or edges refuse to stick it means that the plate is not heated evenly, and it is necessary to apply two separate pressures one to each half of the print.

WORKING UP, COLOURING, ETC.

Encaustic Paste.

Purified beeswax ...	50 parts
Oil of lavender ...	30 parts
Benzole	30 parts
Gum elemi ...	1 part

Finishing Materials.

MATT BROMIDE PRINTS.

Conté Black Stumping Chalk.
Conté Sepia Stumping Chalk.
Conté Powdered Black Lead.
Conté Powdered Charcoal.
Velvet Black or Intense Black Pastel (finest soft).

Prepare the bromide print by first rubbing over with pumice flour with a tuft of wool or flannel in a circular manner, and remove with another piece of wool or duster.

Mix the chosen powder with pumice flour to the tint required and apply with a stump or tortillon. For picking out lights use putty rubber. For sharp lines, use conté crayons in cedar. Special pencils are sold for sulphide-toned prints. If the finish is slight and the powder lightly applied it can be fixed by steaming the print.

GLOSSY BROMIDE PRINTS.

For invisible finishing on glossy paper apply a few grains of spirit nigrosine black, dissolved in "methylated finish," with a rag or brush. In order to match a print, tone the black with Bismarck brown.

Preparing for Colouring.

GLOSSY BROMIDE AND P.O.P.

Rub the prints lightly with a tuft of wool slightly moistened with artists' purified ox-gall.

COLLODION PRINTS.

Fluid extract of quillaia	1 dram (5 c.c.s.)
Water	1 oz. (40 c.c.s.)
Alcohol	1 oz. (40 c.c.s.)

Oil Colours.

For transparent oil colouring special sets of colours are supplied by the principal photographic dealers. Medium for applying to the surface of the prints is supplied with the colours, a special medium being necessary for each manufacturer's colours.

Ordinary artists' oil colours may be used, applied with a piece of soft rag for large areas or tufts of cotton wool or brushes for the smaller details. The list of water colours given will apply equally to oil colouring, excepting that all oil colours are practically transparent if they are used without the admixture of white body colour.

A suitable medium for preparing the surface of the print, may be ordinary megilp thinned with turpentine, or turpentine mixed with about one-third of its volume of linseed oil. Only a trace of medium should be applied.

Water Colours.

For water colour work, a light print is desirable and, for portraiture particularly, a warm brown tone. Some may prefer a deeper print, but that has a tendency to degrade the colouring in the shadows, though it

must be conceded that it provides better modelling in the lights.

Artists' Water Colours.

Ordinary artists' water colours may be used for bromide prints. If matt prints, or those with only a slight sheen are used, no preparation is necessary. The print should be thoroughly moistened and then washes of colour can be applied as on ordinary drawing paper. There is, however, a serious drawback. A second wash of colour cannot be added over a tint previously applied. If any additional depth is required, or any details or modelling to be added, it can only be done by very careful and laborious stippling, and this requires skill and patience. If the colouring is not satisfactory it can be instantly removed by means of a wet sponge.

The following are suitable colours, they are taken from the list issued by one of the principal makers as permanent colours; they are all transparent.

Alizarin Scarlet, Scarlet Madder, Rose Madder, Scarlet Lake, Burnt Sienna, Burnt Umber, Raw Sienna, Raw Umber, Charcoal Grey, Paynes Grey, Prussian Blue, Antwerp Blue, Cobalt Blue, French Ultramarine, Naples Yellow, pale and deep, Cadmium Yellow, Green Oxide of Chromium, Lemon Yellow. Lamp Black and Ivory Black are useful but they can scarcely be classified as transparent. Yellow Ochre, too, is a useful colour, but must be used in pale tints as a deep wash is not very transparent.

Transparent Water Colours.

Although artists' water colours are classified as "transparent" when applied to drawing paper they are not fully transparent when applied to a photographic print. A deep wash would practically obscure the photographic image.

Transparent colours specially prepared for colouring photographs are supplied. They are really dyes which stain the gelatine, and they are so transparent that the photographic image, seen through the colour, loses neither the modelling nor the character. The print should be prepared by thorough moistening as described for using artists' colours: washes can then be applied quite easily. The radical difference between the two methods of colouring is that with these colours, one tint can be applied over another and a colour built up to any desired strength or brilliancy. Or, alternatively, shading or modelling can be strengthened or modified to any desired extent, after the main tints have been applied. The colours cannot be removed after once drying: they can be lightened by soaking the print in water, but that is all. The most satisfactory method of working is to build up to the required depth by a succession of pale washes. These fluid transparent colours can be mixed to produce intermediate tints in the same manner as with artists' colours, though a preferable plan will frequently consist in applying alternate washes of the different colours. Some do not mix well.

Fixative (Crayon and Pastel).

A. Mastic ... ... 24 grs. (1·55 gms.)
Amyl acetate ... 3 ozs. (85 c.c.s.)

Dissolve by agitation, and allow to stand for some hours before use.

B. Celluloid ... 7 grs. (0·45 gm.)
Amyl acetate ... 3 ozs. (85 c.c.s.)

Dissolve by agitation. Mix A and B when both are clear, and keep in tightly-corked bottle. Apply with spray diffuser.

Spotting Bromide Prints.

Mix together Payne's grey and Indian ink (the colour should match that of the film.) For sepia, Indian ink and burnt umber.

Spotting P.O.P. Prints.

Add a little carmine to the above. When mixture is dry (on the palette), work in a strong solution of gum, rubbing the brush one way only, to avoid making air-bells. If the prints are to be enamelled or glazed by stripping after spotting, then artists' oil colours with benzole in which gum dammar has been dissolved, or water colours, may be used with shellac water varnish. (See "Negative Varnishes.")

Air-Brush Colouring.

A method of colouring extensively employed is applying colour in the form of a fine spray by means of the air brush. Liquid water colours are used specially prepared by artists' colourmen, and, unlike ordinary colours applied by hand, a second tint can be applied over a first, though care has to be taken to avoid moving the first tint, and it is preferable to apply the colour to the full depth required in one operation. In this method the colour is applied to the dry print.

A variation of this process is the use of opaque water colours for working up prints for photo-process reproduction. Black, white, and various shades of grey only are employed; and backgrounds, perfectly even in tone, or shaded as required, as well as flat tones in photographs of machinery, etc., are easily obtained of a quality very difficult to obtain in working with a brush.

LANTERN SLIDES.

Lantern plates fall into three main groups, viz.:

Rapid (Black-tone).

These require to be handled in the dark room by bright yellow safelight. In general they give black tones. Some varieties, however, allow warm tones to be obtained with ease. Especially suitable for printing by reduction, and when the closest tone reproduction is desired.

For a cold black tone and with a normal, correctly exposed negative, an exposure of about 5 secs. will be required at three feet from a 16 c.p. bulb. Any standard plate developer (*e.g.*, amidol, hydroquinone, metol-hydroquinone, *etc.*) may be used.

Slow (Warm-tone).

Of slower speed, but still preferably used in the dark room. These plates give a rather stronger contrast and are particularly adapted for making slides of warm colour, ranging from brown to red. The exposure requires to be about four times that for a black-tone plate. When warm black brown or red tones are desired, the exposure is increased and development carried out in a developer heavily restrained with bromide.

Gaslight, etc.

Plates of slow speed, for use in ordinary rooms under conditions as for gaslight-paper printing, giving vigorous contrast and allowing of a wide range of warm tones by direct development. Suitable for printing (by contact) negatives which are excessively soft in contrast. At six inches from a 32 c.p. bulb the exposure required to give a normal (cool-black) tone with a correctly exposed negative will be in the neighbourhood of 45 seconds; and with an appropriate M.Q. or amidol developer (as compounded for gaslight paper), development takes about 30 seconds to 1 minute at 65° F.

When an M.Q. solution containing a large proportion of bromide is employed to obtain warm tones, the exposure is increased up to about five times, development then requiring about 2½ minutes.

In addition to the above, there are a few special varieties, notably the Ilford "Alpha" lantern plate, which gives a very wide range of tones by development.

Developers for Warm Brown Tones on Chloro-Bromide Plates.

The following developing formulæ are those used and advocated by prominent expert makers of lantern slides. Each will produce slides of very great transparency and rich quality with certainty. The results are distinctly superior to those produced by using either ammonium carbonate or thiocarbamide, both of which tend to give a semi-opaque effect. A good slide should have a very transparent image.

No. 1.

Pyro-Ammonia.

E. Dockree

A.	Pyro	80 grs. (18·8 gms.)
	Sodium sulphite, cryst.	220 grs. (50 gms.)
	Sulphurous acid	7 drachms (88 c.c.s.)
	Distilled water to	10 ozs. (1,000 c.c.s.)
B.	Ammonia ·880	2½ drachms (31·2 c.c.s.)
	Ammonium bromide	250 grs. (57 gms.)
	Distilled water to	10 ozs. (1,000 c.c.s.)

The working solution is prepared by taking equal parts of each solution.

Hydroquinone-Rodinal.

J. W. Shaw

A.	Hydroquinone	80 grs. (18·3 gms.)
	Sodium sulphite	1 oz. (100 gms.)
	Citric acid ...	30 grs. (6·9 gms.)
	Potassium bromide	15 grs. (3·4 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)
B.	Sodium hydrate	80 grs. (18·3 gms.)
	Water, to make	10 ozs. (1,000 c.c.s.)

For use, mix as follows :—

Solution A ...	2 drachms (24 c.c.s.)
Solution B ...	2 drachms (24 c.c.s.)
Rodinal (concentrated)	5 minims (1 c.c.)
Potassium bromide (10% soln.)	1 drachm (12 c.c.s.)
Water	1 oz. (100 c.c.s.)
Development 2–2½ mins.	

Pryo-Soda
H. W. Bennett.

A. Pyro	100 grs. (23 gms.)
Sodium sulphite, crystal	800 grs. (183 gms.)
Citric acid ...	50 grs. (11·5 gms.)
Potassium bromide	100 grs. (23 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)
B. Sodium carbonate crystal	800 grs. (183 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)
C. Potassium bromide	100 grs. (23 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

For normal development, take 1 part A; 1 part B; 2 parts water. If still warmer tones are required, take 1 part A; 1 part B; 1 part C; 1 part water. Time of development 4-8 minutes according to the tone.

Chlorquinol.

For Slow Plates.

An excellent developer for warm tones is as follows :—

Sodium sulphite, cryst.	¼ oz. (25 gms.)
Sodium carbonate, cryst.	¼ oz. (25 gms.)
Potassium bromide, 10% solution	100 minims (20 c.c.s.)
Chlorquinol ...	30 grs. (7 gms.)
Water	10 ozs. (1,000 c.c.s.)

Development should take from 2½ to 4 minutes at 65° Fahr.

For warm-brown tones add 25 minims of 10% potassium bromide solution to each ounce of the above Chlorquinol developer (5 c.c.s. to every 100 c.c.s.) and give three times the normal exposure.

For reddish tones add 50 minims of 10% potassium bromide solution to each ounce of the above chlorquinol developer (10 c.c.s. to every 100 c.c.s.) and give 8 times the normal exposure.

Thiocarbamide.

The thiocarbamide developer for lantern slides is one which yields a wide range of colours by simple development, ranging from magenta red through warm brown, cool brown, purple to blue and bluish-grey and on to neutral grey and black. The warmer colours are obtained by greatly increased exposure.

Stock Solutions.

A. Metol	22 grs. (5 gms.)
Hydroquinone	11 grs. (2·5 gms.)
Sodium sulphite, cryst.	½ oz. (50 gms.)
Sodium carbonate, cryst.	½ oz. (50 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)
B. Ammonium carbonate	1 oz. (100 gms.)
Ammonium bromide	1 oz. (100 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)
C. Thiocarbamide	33 grs. (7·5 gms.)
Ammonium bromide	11 grs. (2·5 gms.)
Water, to make	10 ozs. (1,000 c.c.s.)

The chief difficulties in thiocarbamide development are (1) judging the correct density, (2) obtaining the desired colour.

The slide passes through a regular sequence of colour changes, beginning with yellow and passing thence to red, purple, blue-grey and ultimately black, although it is impossible to follow these changes with the eye during development. The problem thus becomes one of so adjusting exposure and developer that the correct density is reached at the same time as the desired colour.

Working developers: For warm-brown tones use A, 14 parts; B, 1 part; C, 1 part. For blue-grey tones, use A, 12 parts; B, 3 parts; C, 1 part. For warm black tones, use A, 10 parts; B, 5 parts; C, 1 part.

Toning.

(1) For a fine brown tone, bleach in mercuric chloride solution (as used for intensification), wash and dry.

(2) Bleach in one of the following solutions, rinse, remove the bichromate stain with weak potassium metabisulphite solution, wash and dry.

A. Potassium bichromate ...	100 grs. (23 gms.)
Hydrochloric acid	43 minims (9 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.)
B. Potassium bichromate	100 grs. (23 gms.)
Potassium bromide	50 grs. (11·5 gms.)
Nitric acid	43 minims (9 c.c.s.)
Water, to make	10 ozs. (1,000 c.c.s.)

C.—Same as above, save that potassium iodide is used in place of bromide.

On exposure to bright daylight, the bleached slide gradually darkens. A slide bleached in A tends to warm brown; one bleached in B becomes cool, grey; and one bleached in C, brown in colour.

Sulphide Toning.

The indirect sulphide process —bleaching and sulphiding— as described for toning bromide prints, may be used for toning lantern slides which have been developed to a cool or warm black. This process produces a fine rich brown colour very transparent in character.

Masking.

Prepare strips of black "needle" paper 3¼ ins. long, and of various widths from ¾ in. to 1 in.

One edge at least must be perfectly clean cut.

Lay the slide, film side up, on white paper, moisten the surface of a suitable strip with the tongue and affix it on the slide so as to mask off to the desired margin.

A sheet of ruled paper laid under the slide helps in placing the strips squarely.

Apply other strips to the remaining three slides and trim off projecting edges with scissors.

Finally affix a white spot or disc on the two upper corners of the face of the slide and proceed to the binding.

Binding.

Select a brand of binding strips of thin, tough paper, coated with strong adhesive, and use the strips in one full length (13¼ ins.).

Lay the strip out, gummed side down, and moisten the back.

When the strip is limp, turn it over, just moisten the gummed side and lay the strip, face up, on a yielding surface, *e.g.*, two thicknesses of blotting paper.

Cover the slide with a thin and carefully cleaned cover-



Fig. 1.

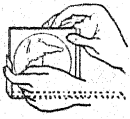


Fig. 2.

glass, place one corner on the gummed strip (Fig. 1) and press it firmly down.

Turn the slide over on edge (Fig. 2) and over again (Fig. 3).



Fig. 3.

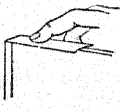


Fig. 4.

At each movement press the slide firmly down on the strip and run the finger *along the edge only* of the strip to cause it to adhere to the slide (Fig. 4).

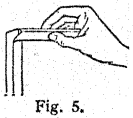


Fig. 5.

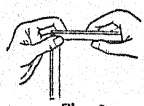


Fig. 6.



Fig. 7.

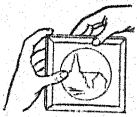


Fig. 8.

Now press the sides of the strip firmly against the glass, pushing the top end of the upright strip away from the glass (Fig. 5).

Continue in the same way with each corner as in Figs. 5, 6 and 7.

The slide completely bound in this way is seen in Fig. 8.

A Simple Method.

An alternative method extensively used is to use four short strips for binding, each one just under 3¼ ins. long, applying them separately.

COLOUR PHOTOGRAPHY.

Lumière "Filmcolor Films."

Increased rapidity.

A guide to exposure is: Give about 20 times the exposure necessary for a plate of 250 H. & D.

Ample exposure should always be given, as there is no remedy for under-exposure, whereas over-exposed films can be easily intensified; in practice many workers prefer to over-expose films and intensify them, as the results are more brilliant. The special filters supplied by Lumière *must* be used.

Two solutions only are used — developer (used also for re-development) and reversing solution. There is no need to fix.

In making the developer stock solution, dissolve the Quinomet in warm water (about 100° F.), add the sulphite, and then, when cold, the ammonia.

Working developer: Stock solution, 1 part; water, 4 parts.

Developer—Stock Solution.

A. Water, distilled	35 ozs. (1,000 c.c.s.)
Metoquinone (Quinomet)	½ oz. (15 gms.)
Soda sulphite, anhydrous	3½ ozs. (100 gms.)
Liquor ammonia, ·920	9 drs. (32 c.c.s.)
Potass. bromide	240 grs. (16 gms.)

For half-plate, place in developing dish the following solution:—

Stock solution A above	1 oz. (20 c.c.s.)
Water	4 ozs. (80 c.c.s.)

If the Filmcolor has been correctly exposed, it should be developed by time. The period is from 2¾ to 3 minutes at 60° Fahr. Most people prefer this method, as it certainly saves risk of fogging.

Always keep the dish in motion.

Alternatively the Filmcolor may be developed by observation.

Place the film in developing dish, pour on the developer and count the number of seconds from the moment of entering until the appearance of the first outlines of the image (the sky should not be taken into consideration). As soon as the outlines appear, note the number of seconds, multiply it by 10 and you will get the total duration of development.

The development must begin out of reach of the light of the lantern which must be fitted with Virida paper; but after 10 or 12 seconds; the film may be rapidly examined.

Reversal of the Image.

Following the development and after a short washing in running water, immerse the film in a dish containing 3 ozs. of the reversing solution and take the dish out in full light. The film which was opaque, clears, and the colours become more and more visible by transmitted light. After half to one-and-a-half minutes, when the plate bears no more trace of a negative image, take it out of

the dish and wash it for about 30 seconds in running water.

REVERSING SOLUTION.

C. Potassium permanganate*	30 grs. (2 gms.)
Sulphuric acid	3 drams (10 c.c.s.)
Water	35 ozs. (1,000 c.c.s.)

* Or Potassium bichromate.

This solution will keep for a short time, but should not be used if cloudy.

Immediately the film is covered by the C solution daylight may be used.

Second Development.—The film is then re-developed in full daylight, using the solution which has served for the first development (kept in the dish without special precautions). When the high-lights are completely darkened (about 3 or 4 minutes) the film is washed for 3 or 4 minutes, and immediately placed to dry. Fixing is unnecessary unless the film is intensified.

Agfacolor Plates and Agfa Ultra Films.

As a guide to exposure, the Agfacolor plate should be given 30 times the exposure required by a normal plate of speed 18° Scheiner, while the Agfa Ultra film should receive 4 times the exposure of a plate of speed 18° Scheiner. The new, fast Agfacolor-Ultra plates have a daylight speed equivalent to a plate of about 18° Scheiner.

Development is undertaken in a Metol formula of the following composition :—

Concentrated Stock Solution.

Metol (Agfa) ...	115 grs (13 gms.)
Sodium sulphite (Anhydrous)	2 ozs. (100 gms.
Potassium bromide	48 grs. (5·5 gms.)
Ammonia (sp. gr. 0·91)	4¾ drams. (30 c.c.s.)
Water	18 ozs. (900 c.c.s.)

In making up, dissolve in the order given at a temperature of 110° Fahrenheit (35° C.) and allow to cool. The ammonia is then added, and before use, the solution should be filtered. The working solution for each exposure should be made up of 1 part of stock solution to 3 parts of water.

The working developer is used for the re-development, but must not be used again. The temperature of the working developer must not be higher than 65° F. If it is too warm, it is liable to cause softening and frilling of the film. With correct exposure, development is complete in 3 minutes for plates and 4 for Ultra films.

Development having been completed, the plate is rinsed for about one minute (not longer) in running water, not under the tap. It is then put in the reversing bath.

Stock Solution for Reversing Bath.

Potassium bichromate	1 oz. (50 gms.)
Sulphuric acid, strong	2 ozs. (100 c.c.s.)
Water	20 ozs. (1,000 c.c.s.)

One part of this stock solution is mixed with 10 parts of water to form the reversing bath, which must not be warmer

than 65° F. After one minute in this bath, the light may be turned on, and as soon as it is seen, by transmitted light, that the black silver image has been removed, the plate is taken out and at once put to wash for about 3 minutes in running water. It is then re-developed in strong light in the same developing solution as used in the first instance, and is then well rinsed and put aside to dry.

Desensitising.

This is best carried out in a bath of Pinacryptol Yellow, of a strength of 1 : 2,000. The plate must remain in this solution for 2 minutes in darkness. It is then transferred to the developer without intermediate washing and development continued in the usual manner, by red light, but for one minute longer than the usual time.

Finlay Colour Process.

This is a screen-plate process on the principle of the Joly process. The process was formerly known as the Paget, and at a later date was marketed under the name of Duplex. But the Finlay colour plate is a great advance in manufacture and allows shorter exposures than other colour processes.

The exposure is made on one of a variety of special panchromatic plates of varying speeds. The selected make of plate is placed in the dark slide behind the Finlay taking screen with a Finlay compensating filter on the lens. The speed of each selected panchromatic plate when exposed through the Finlay screen and the Compensating filter is reduced approximately five times that of black-and-white. Therefore exposures in the neighbourhood of 1/100 of a second at *f*/4·5 inland, and 1/200 of a second at *f*4·5 by the sea, may be obtained in bright sunshine, using the fastest type of pan plate.

Panchromatic plates should be developed in a soft working developer, such as Metol. The following formula works well. When developed the plate is fixed in the usual way.

Metol Developer.

A.	Metol	¾ oz. (35 gms.)
	Sodium sulphite cryst.	2½ ozs. (118 gms.)
	Water, to make	20 ozs. (1,000 c.c.s.)
B.	Sodium carbonate cryst.	3½ ozs. (165 gms.)
	Potassium bromide ...	16 grs. (1·5 gms.)
	Water, to make	20 ozs. (1,000 c.c.s.)

For use, take equal parts of above stock solution and water. Development is complete in 2 minutes at 65° F. In printing, a Finlay positive plate is placed in contact with the finished negative in an ordinary printing frame and exposed to a bare (not diffused) half-watt lamp. At 6ft. from an ordinary 15 watt half-watt lamp, exposure is 12 seconds. In developing the positive plate a more contrasty developer should be used, *e.g.*, metol-hydroquinone, or,

A.	Potassium Metabisulphite	½ oz. (25 gms.)
	Hydroquinone	½ oz. (25 gms.)
	Potassium bromide ...	½ oz. (25 gms.)
	Water, to make	20 ozs. (1,000 c.c.s.)

B. Caustic potash 1 oz. (50 gms.)
Water (cold) ... 20 ozs. (1,000 c.c.s.)

For use, equal parts A and B.

Development is complete in 1 minute. Fix in the usual way.

When the positive plate is dry, it is brought into correct register with the Finlay viewing screen, the picture appearing in its correct colours. The two plates are then bound together.

It is also possible to make an ordinary print on paper from the negative.

Finlay Non-Parallax Colour Screen.

This screen is a further refinement in the process, allowing of the making of colour transparencies which do not change colour according to the angle from which they are viewed.

The screens are coated with an emulsion of the gaslight kind and require to be handled in yellow or light green light. In printing the screen is registered with the negative as follows :— The sensitive colour screen is placed emulsion side in contact with the negative, and, by means of the registering edges at each end of the negative, the negative and positive plate are gently moved until the colours are seen to be complementary when viewed by the printing light. The screen and negative are clipped together on all four sides with bull-dog clips, placed on a piece of black board (negative upwards) and exposed to a bare metal-filament half-watt bulb of 100 watts at about 3 ft. distance. With average negatives the exposure is about one minute. Under exposure should be avoided.

Dufaycolor.

MATERIAL AVAILABLE.

Dufaycolor is available in two forms :—

Type D.1, which includes Roll Films, Film Packs and 35 mm. film for miniature cameras.

Type D.2, which includes Flat Film and film for sub-standard Cinematography.

The differences lie in the colour-balance of the two materials. Type D.1. is so balanced that it gives correct colour rendering in daylight without any external filter. Type D.2. needs an external filter in daylight. The *working* speed of both materials in daylight is the same.

The Flat Film Type D.2. is made on a thicker base than the other packings. All Dufaycolor film base is non-inflammable.

In artificial light both types of material require appropriate filters for each type of light; as the two materials are differently balanced two different ranges of filters are required, the filters for one type not being suitable for use with the other type. These filters are coded, and can be obtained by quoting the code, but if the very highest possible degree of correction is desired it is advisable to quote the batch number of the material for which the

filter is required or, if ordering the filter at the same time as the material, to ask that the filter shall be matched for the batch.

DUFAYCOLOR FILTER CODE

Light	Filter required for	
	Type D.1	Type D.2
Daylight	None	D2/1
Half-watt (including high efficiency or projector type lamps) and Pointolite ...	D1/2	D2/2
Photoflood and similar types of lamp ...	D1/3	D2/3
Sashalite and similar types of bulb ...	D1/4	D2/4
Arc light (white flame carbons)	—	D2/5

LOADING.

The following are instructions for *Dufaycolor Flat Film.*

During loading and unloading the film should be handled in *complete darkness.*

The film has to be exposed through the base, which must therefore be kept free from finger marks; handle by the edges only. The film is packed six sheets in a box, all facing the same direction; each piece of film has hinged to it at one end a sheet of black paper, of exactly the same size, which covers and protects the emulsion coated surface; this paper should not be removed until immediately before development, when it should be opened out and a gentle sideways pull will cause the adhesive strip to peel evenly off the film without any tearing.

The ordinary film sheath is a convenient method of holding the film for loading in the dark slide; insert first that end of the film which is attached to the backing paper. For single dark slides the film may be placed with its paper protector in contact with a sheet of thin glass or best quality cardboard and the edge attached with narrow strips of adhesive tape. In some double dark slides the film is best placed behind a sheet of best quality flat glass, the thickness of glass being compensated for by reversing the focussing screen so that the smooth side is towards the lens.

Dufaycolor Roll Film and Film Packs and Dufaycolor 35 mm. cassettes for miniature cameras are handled in the normal way. When loading Dufaycolor 35 mm. refills into miniature camera cassettes care must be taken to ensure that the back of the film shall face towards the lens, otherwise a black and white picture will be obtained.

EXPOSURE.

The most reliable method of obtaining correct exposure is by the use of an exposure meter, and the photo-electric meter is the most suitable for the purpose. The Ilford meter is of this type.

Here are some representative speed figures :—

Photo Electric Meters.	*Speed.*
Avo	400 H & D
Ilford	Class C
Leicameter	17° Weston Scheiner
Ombrux	17° Scheiner
Tempiphot	19° Scheiner
Weston	6 (Normal subject)
Extinction Meters.	*Speed.*
Justodrem	20–23° Scheiner
Justophot	16–19° Scheiner
Leudi	22° Scheiner

PROCESSING.

Dufaycolor sub-standard cine film is sold at a price which includes the cost of processing. All other forms of the material are sold at a price which does not include this service, but expert processing of every type of Dufaycolor can be obtained from Ilford Ltd., through the photographic dealer. This service is useful to the newcomer to the processing of Dufaycolor, as it provides him with a standard of comparison.

Processing instructions are not issued with Roll film, but the following instructions apply equally well to Roll Film as to the other types of the material.

Two alternative methods are given according to whether it is desired to watch the first development. In commercial work where standardised exposures can be given the Constant First Development is recommended but for the outdoor worker or amateur the Factorial Development may be preferable. Whichever method is employed great care must be taken to avoid fogging ; uniform fogging (*e.g.*, by an unsafe darkroom lamp) is not apparent as veiling but causes a general loss of density and flattening of the image.

CONSTANT FIRST DEVELOPMENT METHOD.

Work in total darkness or with an Ilford " G " Safelight shielded so that the direct light cannot fall on the film.

Immerse in one of the following developers for 3 minutes at 65° F. (2½ minutes at 70° F. or 2 minutes at 75° F.), vigorously rocking the dish the whole time ; agitation increases the brilliance of the transparencies. Formula A gives slightly softer results than B.

DEVELOPER A.

Metol	65 grs.	or	6·5 gms.
Sodium sulphite (cryst.)	2 ozs.		100 gms.
Hydroquinone	20 grs.		2·0 gms.
Potassium bromide ...	25 grs.		2·75 gms.
Ammonia (sp. gr. 880) ...	105 minims		11 c.c.s.
Water to	20 ozs.		1000 c.c.s.

NOTE :—Great care should be taken to ensure that the ·880 ammonia is of full strength. Otherwise very disappointing results may be obtained.

DEVELOPER B.

Metol	65 grs.		6·5 gms.
Sodium sulphite (cryst.)	2 ozs.		100 gms.
Hydroquinone	20 grs.		2·0 gms.
Sodium carbonate (cryst.)	2 ozs.	or	100 gms.
Potassium bromide ...	25 grs.		2·75 gms.
Potassium thiocyanate (sulphocyanide) (pure)	80 grs.		9·0 gms.
Water to	20 ozs.		1,000 c.c.s.

Used developer may be employed for the second development process (see below) but not for the first development of another film.

FACTORIAL FIRST DEVELOPMENT METHOD.

Desensitising :—First immerse in total darkness in a 1 : 2,000 solution of Pinacryptol Yellow for 2 minutes, rinse for 1 minute and transfer to the developer.

After desensitising the Ilford Iso Safelight (Red) with 25 watt lamp should be employed ; the film should not be examined at less than 3 ft. from the safelight.

Take two dishes and in the first put 1 part of either of the developers given above and 3 parts of water, and into the second dish pour full strength developer. Place the film in the weak developer and note the time required for the first appearance of the image (ignoring the brightest highlights). Then transfer the film to the full strength developer and continue development (preferably in darkness) for a period equal to 3 times the time in the first bath. Continuous agitation by rocking the dish is desirable throughout the whole period of development.

BLEACHING BATH.

After development, by whichever method is chosen, rinse the film and transfer to the following bath for 5 minutes until all the negative silver image is dissolved.

Potassium permanganate	20 grs.		2 gms.
Conc. sulphuric acid ...	100 minims	or	10 c.c.s.
Water	20 ozs.		1,000 c.c.s.

It is important to agitate the film during the bleaching operation.

White light may be turned on after the film has been at least 15 seconds in the bleaching bath and all subsequent operations may be carried out in this white light.

CLEARING BATH.

Rinse and remove the brown stain in the following bath :—

Potassium metabisulphite	½ oz.	or	25 gms.
Water	20 ozs.		1,000 c.c.s.

SECOND EXPOSURE.

Rinse for 2 minutes and expose the emulsion side of the film for 20 to 30 seconds at one foot from a 100 watt lamp. Too much exposure is preferable to too little, but do not expose to daylight.

REDEVELOPMENT.

Redevelop for 4 to 5 minutes in the first developer (full strength) or in any rapid working M.Q. developer.

FIXATION AND WASHING.

Rinse and immerse for two minutes in an ordinary or acid hypo fixing bath. Wash in running water for 15 minutes.

DRYING.

Carefully wipe the back with wet cotton wool to remove surplus moisture and hang up where nothing can touch the surface.

It is not necessary to varnish Dufaycolor transparencies.

AFTER TREATMENT OF DENSE OR THIN TRANSPARENCIES.

Applicable only when the Constant First Development method has been employed, when errors in exposure can be partially compensated for by reduction or intensification. Factorial development makes the same compensation during the development.

REDUCTION.

Under exposure leads to dense transparencies. These may be reduced by immersing in the following bath :—

Soln. A.	Hypo	1 oz.	or	10 gm.
	Sodium carbonate (cryst)	¾ oz.		8 gm.
	Water	20 ozs.		200 c.c.s.
Soln. B.	Potassium ferricyanide	50 grs.	or	1 gm.
	Water	20 ozs.		200 c.c.s.

For use take equal parts of A and B.

It is important that these concentrations be adhered to. The carbonate increases the life of the bath but may be omitted when the bath is used immediately after mixing. The film should be removed from the bath immediately the density appears correct by visual examination; wash for 10-15 minutes.

INTENSIFICATION.

Over-exposure results in thin transparencies lacking in colour. These may be intensified by soaking the film in water for a few minutes and then immersing in the following bath until the desired density is obtained.

(a)	Hydroquinone	130 grs.	or	3 gms.
	Citric acid	64 grs.		1·5 gms.
	Water (distilled)	20 ozs.		200 c.c.s.
(b)	Silver nitrate	105 grs.	or	2·5 gms.
	Water (distilled)	20 ozs.		200 c.c.s.

For use mix immediately before required equal parts of A and B.

The dishes to be used should first be rendered absolutely clean by treating with a 10 per cent. solution of nitric acid and thoroughly rinsing in water. After intensification the film should be washed for 10 to 15 minutes.

Note: Some notes on the After-Treatment of Colour Transparencies will be found in the Epitome of Progress.

COLOUR SEPARATION NEGATIVES.

Summarised Instructions for Making Three-Colour Separation Negatives of Still-Life Objects.

The instructions which follow are reprinted by courtesy of Messrs. Colour Photographs (British & Foreign) Ltd., who have developed them as the result of exhaustive experience in the working of their Vivex Process. They are, however, equally applicable where the photographer desires to make his own colour prints by, for example, the Carbro process, and we include them because they will be found of the greatest assistance to the colour worker.

Certain specific directions relating to the Vivex process have, on account of restricted space, been omitted. Any reader who may be interested in the making of colour separation negatives with a view to their being subsequently printed by the Vivex process by Messrs. Colour Photographs Ltd. should therefore write to them for their leaflets on the subject.

Lighting.

In lighting a subject for colour remember that you are to a large extent freed from the limitations of monochrome. Colour contrast will help the modelling and therefore, except for bold and vigorous effects, a much flatter lighting than is usually desirable in monochrome can be used. Remember also that the beauty of a colour photograph is largely dependent upon the truthful rendering and proper differentiation of the more delicate and subtle colours. These will be rendered in the negative by the dense portions, and since hue is determined by the keeping of the proper proportionate density in each of the three negatives, flattening of the curve by over-exposure with consequent limitation of the separation between the tones in this region must be avoided. On the other hand under-exposure is fatal to a proper rendering of the shadows and darker colours.

In effect therefore, a negative which gives its best print on a vigorous or a soft paper will never be so truthful in its rendering of colour as such, as one which having received the correct exposure and development is most suitably printed on normal bromide paper.

Light Sources.

If accurate colour rendering is required the subject must be illuminated with only one-type of light source. The majority of separation sets are made either by daylight or half-watt. Mercury vapour lamps are not suitable for colour work.

Mixed lighting should not be used. A simple experiment demonstrating the unsuitability of mixed lighting except for special effects is made by painting horizontal stripes of colour on a sheet of white card and bending it into a cylinder. Illuminate one side with half-watt light and the other side with daylight or arc. The white portions will appear yellowish on the half-watt side and, by contrast, bluish on the other, whilst the colours suffer even more remarkable changes which are not normally appreciated because of the rapidity

with which the human eye adapts itself to various types of lighting. Two seconds after entering a room lit with half-watt light the eye unhesitatingly accepts a sheet of paper as white because it has no opportunity of comparing it with true white.

Unfortunately, many photographers assume that by lighting the subject solely with half-watt light, the mixed light errors have been eliminated. If however, some of this light is indirect (reaching the object via a coloured studio wall), some is direct but has behind it dirty or discoloured reflectors, and the remainder is spot lighting with perhaps tissue-paper diffusers in front, there are in effect three different coloured lightings being used and although the eye will not necessarily appreciate the subtle differences in their colour compositions, the photographic plate will do so.

The errors in colour rendering which result are usually small and can be corrected by retouching the negatives or by paint on the print. Both these devices, besides adding to the cost and time taken, are never so satisfactory as starting with a properly lit subject in the first place. They are the first step towards destroying realism.

Half-watt will be found the most suitable lighting for all subjects except open air studies. It is controllable, convenient, reliable, and once the correct factors for your studio have been obtained, constant. If you prefer flashed opal or frosted bulbs, have them *all* of one type. If you prefer the clear glass type with reflectors to hide the filament, see that the back reflectors are painted white. If tinted reflectors (e.g., pale egg-shell blue) are used, the studio walls are preferably this same colour, but white is preferable when practical.

The spot light presents the greatest difficulty, but a pale filter can be obtained* which will alter the colour of its light to correspond to the general illumination.

Probably the cheapest way of installing half-watt for colour is to make two upright battens from 6″ planks standing on a firm base and mount on each a vertical row of say 15 150-watt frosted bulbs each with a white porcelain or stainless steel reflector. These are used for the general illumination of the model and their light alone should be sufficient to give a well-exposed negative. Modelling is now introduced by spot-lights or rest lights fitted with filters which bring the colour of these lights to those of the batten lights.

* Supplied by Messrs. Colour Photographs Ltd.

REFERENCE OBJECT.

A reference object must be included in every subject. This is made up of three squares, one each of black, white and grey paper of such a size that it forms square patches on the edge of the negative not smaller than $\frac{1}{4}$″ square. Unless all three squares have at least this area, accurate measurement of their densities is impossible and it will be necessary to make an extra charge if critical colour balance is required by the client. This reference object need not be in focus, but it should receive the average illumination of the rest of the subject; it can very easily be made up of bromide paper suitably exposed to produce a good white, a grey and a black.

LENS.

A good anastigmat lens is the most suitable for colour work and if the negatives are to be used for half-tone reproduction or any other method of colour printing than our own it is essential that a good anastigmat be used, since any other type of lens may produce images of slightly different sizes.

Portrait lenses, rapid rectilinears, etc., often have the defect that they do not focus the images through the filters in exactly the same plane, but for still-life work, at small apertures this is often unimportant.

Some of the cheaper lenses are liable to lens flare, but this can be minimised by the adequate lens hood essential for all work of this nature.

NEGATIVE MATERIAL.

Any good quality panchromatic plate or film can be used, but all the plates should be backed.

For average work an emulsion of the type of Ilford Soft Gradation or Special Rapid plates is suitable.

Since the images on the three negatives must be of identical size it is essential that the dark slides used should each be of the same register, and if film is used, care should be taken to see that it lies absolutely flat.

Any size of negative can be used since either contact prints, enlargements or reductions can be made. We prefer to work, except for contact prints, with negatives not larger than 1/1 pl. size, and for economy it will be found that negatives of 1/4 pl. to 1/2 pl. size will give perfectly satisfactory prints of most subjects up to 20 × 16 print size.

FILTERS.

Tricolour filters are usually in the form of coloured sheets of thin gelatine. These can be used without mounting either in front, behind or between the elements of the lens. Care must be taken, however, not to damage the surface of the filters and preferably they should be mounted by their edges in cardboard so that they can be attached to the front or back element of the lens.

It is imperative that no light shall pass through the lens which does not pass through the filters.

These filters are also available cemented between glass and can then be used with a suitable holder in front or behind the lens, or if filters of the same size as the plates are being used they should be used immediately in front of the plate surface.

EXPOSURE.

A good colour print can only be made from three correctly exposed negatives.

For different types of lighting the relative exposure of the three negatives will vary.

The following are the approximate filter factors for average panchromatic material to the various light sources :—

	Red filter	*Green filter*	*Blue filter*
Daylight or open flame arclight	7	9	5
Half-watt light (nitrolight) ...	3	9	13

These filter factors indicate the number of times by which the normal exposure without filters must be multiplied. For instance photographing a group of perfume bottles in a studio by daylight, if the exposure on an Ilford S. G. Panchromatic plate was 2 seconds without filters at *f*16, then for a separation set the exposures would be :—

Red filter	*Green filter*	*Blue filter*
14 secs.	18 secs.	10 secs.

whereas with half-watt light, if the plate without the filter required the same exposure at *f*8, then the exposure for a separation set would be :—

Red filter	*Green filter*	*Blue filter*
6 secs.	18 secs.	26 secs.

In a correctly exposed set of negatives the mid-grey patch of the reference chart should appear practically the same density on all three negatives (approximately a density of 1·0).

Whenever possible it is of the greatest advantage to make an extra negative through the red or green filter and to develop and inspect this before deciding upon the treatment to be given to the set proper.

When first quality results are essential this trial negative should be proofed on normal bromide paper in order to determine whether the development time which it is proposed to give to the set will result in the general contrast and rendering which is desired.

When working under strange or modified lighting-conditions it is always desirable to make a trial set of negatives in which the reference chart is prominently displayed and to determine from inspection (and bromide prints if time will permit) whether any modification in the filter factor times is indicated. The value of this precaution cannot be over-emphasised.

Development.

Any normal developer is suitable and either dish or tank development can be used. It is essential that the plates or films be really evenly developed and in order that the three negatives shall be of similar contrast they should be developed together.

Dish Development.

For dish developer take one part of the above, or of Kodak E. P. F. developer, to ten parts of water. Use plenty of developer so that the plates are quickly and evenly covered. The dish should be rocked during the whole of the developing time, care being taken to keep the rocking out of phase. Use a 10 × 8 dish for three-quarter plates. For whole plate sets use three 10 × 8 dishes, one plate in each, and rock all dishes together.

In order that the three negatives shall be of similar contrast it is necessary to develop the blue filter negative for approximately 50 per cent. longer than the other two. The actual percentage

increase in development time required varies somewhat from batch to batch and failing definite information from the manufacturer can only be determined by experiment. See below. (Messrs. Colour Photographs Ltd. advise the necessary increase for batches of plates supplied by them).

Developer temperature should be kept at 65° F. (18° C.). The average time of development for the red and green filter negatives under the above conditions is five minutes.

TANK DEVELOPMENT (recommended only for negatives up to 9 × 12 cms. in size).

The following developer is recommended :—

Metol	3·8 grammes
Hydroquinone	15·5 ,,
Sodium carbonate (cryst.)	226 ,,
Sodium sulphite (cryst.)	455 ,,
Pyro	15·5 ,,
Pot. bromide (10 per cent. solution) ...	17·6 c.c.
Water to	2000 ,,

Those who prefer a ready mixed developer should use Kodak E. P. F. developer.

With the procedure outlined below perfectly evenly developed negatives should result when a minimum developing time of at least 5 minutes is given.

A fresh tank of developer is made up—stock 1 part, water 10 parts. Lower the rack containing the plates slowly into the developer and when completely immersed agitate vigorously for ten seconds. Leave undisturbed for two minutes and again agitate vigorously for five seconds. Leave undisturbed for another two minutes. Repeat this procedure until the total time has elapsed.

Developer temperature should be kept at 65° F. (18° C.).

The negatives are then fixed for 15 minutes in a fresh fixing bath, washed thoroughly, the surface carefully wiped with a tuft of cotton wool whilst the plate is flooded with running water, and dried naturally.

TANKS.

A suitable type of tank is that made of hard-rubber, and it should preferably be one size larger than the required rack—i.e., for 1/4 plate negatives, a 1/4 plate rack and 5 × 4 tank 9 × 12 cm. rack use 5 × 4 tank.

In order to test the suitability of any type of tank, adopt the following procedure :—

Take a number of plates and fog them very slightly. Place over them a piece of black card in which a few holes have been punched and give them a fairly full exposure. Develop these plates in the tank you propose to use and with the technique of rocking or stirring you propose to adopt. After fixation, an even deposit of grey should cover the whole plate and measurements of the density of this deposit will enable faulty technique to be detected.

Major errors will reveal themselves on inspection of the negatives (flow marks caused by soluble bromide liberated from the fully exposed spots reducing the density under these spots; uneven development of the flat areas due to constant direction eddy currents being set up by the method of rocking adopted, etc.), but measurements on a photometer will be needed to reveal more subtle faults in the plates if these are present. One such test plate should be included in every batch of plates developed.

NOTE ON CONTRAST.

Unless the contrast of all three negatives is identical it is impossible to reproduce a grey wedge, and hence all other colour ranges. If, for example, the blue filter negative is soft due to insufficient extra development, then, when the middle tones of the wedge are grey the heavier steps will be brown and the lighter steps purple. If the exposures are adjusted to make the lighter steps grey the brown shade of the darker tones is accentuated. A similar falsification occurs with all other colours.

One can easily judge whether the contrast of the three negatives is identical by determining whether there exist three exposures at which the reference wedge from all three negatives appears identical in appearance when printed on normal bromide paper.

In addition to the above mentioned difficulties, unless the contrast of all three negatives is alike the definition of the colour print may be imperfect, even although each negative is capable of giving a perfectly sharp bromide print. The ratio of exposures through each negative which must be given to obtain the best colour balance compromise may be such that when definition of two is satisfactory throughout the range, that of the third is lacking.

PROCEDURE WHICH SHOULD RESULT IN PERFECT SETS OF SEPARATION NEGATIVES.

Assume that it is required to make a number of separation sets of still-life subjects and it has been decided to do this with half-watt lighting.

(1) Obtain a sufficient number of backed panchromatic plates all of the same batch number.

(2) In the studio, under the lighting conditions it is proposed to use, make a separation set of a chart consisting of patches of white, grey and black card. This chart can conveniently be built up from fogged and developed bromide paper. Give, in the first instance, the filter factors recommended by the plate-makers for half-watt, e.g., with tricolour filters × 3 for red, × 9 for green, × 13 for the blue filter.

(3) In the darkroom, arrange that the air temperature be as near 65° Fah. (18° C.) as is practical. Bring the temperature of the developing dish to 65° Fah. by filling with water at approximately this temperature.

(4) Bring sufficient developer (say 8 c.c.s. per square inch of plate) to 65° Fah.

(5) Place all three plates in the dish, remembering which is the blue filter negative. Flood with developer, removing air-bells with finger tips, and start clock.

(6) Rock for the total developing time, taking care to keep the rocking out of phase so that uniform currents do not occur in the dish.

(7) At the end of 5 minutes with E.P.F. developer remove red and green filter negatives to fixer and at end of 7½-10 minutes (see note under dish development) remove blue filter negative to fixer.

(8) When dry examine the plates for exposure and for similarity of contrast. In the absence of a photometer which will actually measure the densities, it is a good plan to make bromide prints and compare the grey scales visually.

(9) If necessary, repeat the operations 2-8, altering the exposure, the filter factors, the relative development times or the total development times as the first experiment has suggested, until three negatives of proper contrast and known filter factors are obtained. For the majority of printing processes aim at a density range of 0·5 to 1·6. See, however, Cartwright, Phot. J. 1933, p. 59.

(10) Now proceed with the making of the sets, bearing in mind the general recommendations made above.

(11) After washing the negatives remove water droplets by sponging the gelatine surface gently with a swab of cotton wool from which the bulk of the water has been squeezed out. Stand the negatives in a drying rack, the images being in the same relative position, and leave undisturbed until dry.

Attributes of Colour Separation Negatives to be Regarded as Satisfactory for Printing.

(1) The reference chart included in the subject is square on to one edge of the negatives and ¼ in. in and each patch is not less than ¼ in. square.

(2) Exposure ratios were accurate so that by visual examination the mid-grey patch of the chart appears exactly the same density on all three negatives (roughly a density of 1·0).

(3) The densities of the chart range from roughly 0·5 to 1·6 on each negative and the three negatives have identical contrast (i.e., both black and white patches of the chart on one negative match their corresponding densities on the other two).

(4) The subject was illuminated by one type of light source only.

(5) A lens hood was used on the camera to prevent flare.

(6) The negatives were evenly developed being absolutely free from flow marks, run marks, light fog, spots or stains.

Minimum time of development ... ... 5 minutes

(7) Backed plates were used.

(8) The negative gives its best print on normal bromide paper after 2 minutes development in B. J. amidol.

CINEMATOGRAPHY.

The number of different negative, reversal and positive stocks at present available, and the fact that each manufacturer markets at least one or more separate emulsions for specialised purposes, makes the question of processing equally specialised.

The following information has been collated with the kind assistance of the technical and research departments of the manufacturer mentioned in each case.

Of interest is the graph showing two curves, one for stagnant and one for agitated development in a developer of the same formula and at the same temperature, on page 386, which is reproduced from the Bulletin NF-4 of the Du Pont Film Mfg. Corp. Note should also be made of the present practice of developing to a definite gamma, rather than the older hit-and-miss inspection method. Other points of interest are indicated in the individual formulæ.

Agfa Limited.

A considerable number of specialised materials are available and are listed below, with their specific usefulness set out against each.

Superpan and Pankine Type H. Anti-halo negatives	Super-speed panchromatic negatives for artificial light exposures.
Orthokine negative ...	Highly orthochromatic negative.
Aerochrom negative ...	Highly orthochromatic negative of steep gradation and fast speed, specially suitable for aircraft and distant landscape working.
" R " negative ...	Sensitised for Infra-red.
" Bi-pack " negative...	For subtractive two-colour processes by the bi-pack method.
Dupe Positive... ...	For the preparation of intermediate master positives by copying.
Dupe Negative ...	For the preparation of duplicate negatives from intermediate master positives.
" Tf 4 " Sound negative	For the variable-width process, and for variable-density with small range of exposure of light intensity (Toe-recording process.)
"Positive Film for Sound Recording"	Positive stock with footage numbering for recording by either variable-density or variable-width recording processes.
Sound Negative film " special "	For either variable-density or variable-width recording with little exposure range and small light intensity. (Toe Recording.)

Formula No. 15. Machine developer. Fine-grain.

Metol	8·0 gms.
Sodium sulphite (anhyd.) ...	12·5 gms.
Sodium carbonate (anhyd.) ...	1·2 gms.
Potassium bromide	0·15 gms.
Water, up to	1,000 ccs.

Time 5 to 8 minutes at 65° F.

Suitable for Pankine type H. Orthokine "R" and Bi-pack, and for soft results on the general "Positive film for sound recording."

Formula No. 22. Contrast developer (also useful for titles).

Metol	0·8 gms.
Hydroquinone	8·0 gms.
Sodium sulphite (anhyd.) ...	40·0 gms.
Potassium carbonate	50·0 gms.
Potassium bromide	5·0 gms.
Water, up to	1,000 ccs.

Time 5 to 8 minutes at 65° F.

Suitable for "Tf 4" sound negative, and for contrast on the general "Positive film for sound recording" and the sound negative film "Special."

Formula IV. Fixing-hardening bath for machine processing.

Chrome alum	0·03 kilos.
Soda bisulphite lye (38-40 Bé)	0·1 litres.
Sodium sulphite (anhyd.) ...	0·017 kilos.
Sodium hyposulphite	0·34 kilos.
Water, up to	1,000 ccs.

Time. From 3 to 6 minutes.

Where an intermediate hardening bath is recommended, as in the tropics, it is almost essential that the pH value be kept to a constant figure to ensure the maximum efficiency; the activity of chrome alum being decreased by alkali from the developer being carried over.

SUB-STANDARD MATERIAL.

Isopan ISS 16 mm reversal	Superspeed panchromatic stock, suitable both for exterior and interior.
Pan 16 mm. Reversal	Slower in speed than above.
Isopan 8 mm. Reversal	Same speed as Pan 16 mm.
Isopan FF 16 mm. Negative	A special fine-grain emulsion for the negative-positive process.

Formula No. 14 Developer for sub-standard negative stocks where specially fine-grain is essential.

Metol	4·5 gms.
Sodium sulphite (anhyd.) ...	85·0 gms.
Sodium carbonate (anhyd.) ...	1·0 gms.
Potassium bromide	0·5 gms.
Water, up to	1,000 ccs.

Time. Approximately 15 minutes at 65° F.

Suitable for sub-standard normal panchromatic fine-grain negative. 16 mm.

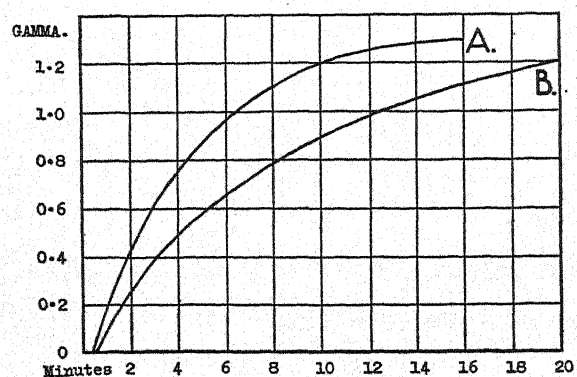
Du Pont Film Mfg. Corp.

Three negative materials are available in this country, the Regular, Special and Superior, and the same formula is recommended for each. A gamma of 0·7 is stated to be the usual figure to which development is carried, and with agitated development this figure is attained in 3·7 minutes according to the curve "A" in the graph, for the Regular and Special stocks. The Superior needs 4·5 minutes to reach the same gamma. With stagnant development, however, the first two named stocks will need 7·0 minutes to attain the required figure as will be seen from the curve "B"; the Superior needing longer again if a higher figure is required.

Formula.

Rhodol	2·5 gms.
Sodium sulphite (anhyd.) ...	75·0 gms.
Hydroquinone	3·0 gms.
Borax	5·0 gms.
Water, up to	1,000 ccs.

Development temperature 68° F.



A = Agitated development at 68°F.
B = Stagnant development at 68°F.

From Bulletin NF—4 Du Pont Corporation.

Gevaert Limited.

This company caters for every cinematograph requirement as regards the different gauges of film, and the various types are listed below, with developing formulæ for the various materials.

Standard 35 mm.

Panchromosa Type 37...	A new Panchromatic Negative of greatly increased speed, approximately 32/33° Sch.
Panchromosa	Panchromatic negative of extreme speed, normal gradation and fine-grain.

Special Fine-grain (Yellow label) ...	Orthochromatic negative for work requiring extra fine-grain.
"S.T.1." Soundfilm ...	Negative for the variable density system with great light fluctuations.
"S.T.2." Soundfilm ...	Negative for the variable density system with small light fluctuations, and for the variable area system.
"S.T.O." Positive ...	For recording on either system with illuminants of high intensity.
Positive	For negative printing, B. & W., and in ten colours.
Positive	Safety-base.
Duplicating Negative	For the preparation of dupes, rendering a very soft result.
Duplicating Positive ...	Known as type "G." Supplied in either B. & W. or with Lavender Base. Much slower than ordinary positive, but gives an exceedingly soft picture, particularly suitable for making soft prints.
Bi-pack Negative ...	Comprising an Orthochromatic front film and a Panchromatic back film with a red filter coating on the front film for two-colour work.
Duplex anti-halo ...	Special positive for the printing of two-colour process colour-films.

Sub-standard. 16 mm.

Panchro Super Reversal	Direct reversal material of super-speed. May also be used as a negative.
Panchro Negative ...	Negative of normal speed.
Ortho Reversal... ...	Direct reversal material for general use, orthochromatic quality.
Ortho Negative ...	Orthochromatic negative material of very fine grain.
Positive	Normal type positive suitable for printing and for titling. In B. & W., and five colours.
Safety Duplicating Negative.	Of the same general quality as the standard 35 mm. duplicating film, on the standard non-inflammable base for sub-standard use.

Sub-standard. 9·5 mm.

Panchro Super Reversal; Orthochromatic Reversal; Orthochromatic Negative; Positive and the Safety Duplicating Negative. Qualities as for Sub-standard 16 mm.

Sub-standard. 8 mm.

Panchro Super Reversal and Orthochromatic Reversal only.

Developers. Standard and sub-standard.

Fine-grain borax developer for Panchromosa.

Metol	2 gms.
Sodium sulphite (anhyd.) ...	100 gms.
Hydroquinone	4 gms.
Borax	2 gms.
Water, up to	... 1,000 ccs.

Time. 8 to 10 minutes at 65° F.

Developer for sound-film negative " S.T.2," or " S.T.0," when used for variable area recording.

Metol	2 gms.
Hydroquinone	5 gms.
Sodium sulphite (anhyd.) ...	50 gms.
Potassium carbonate	30 gms.
Potassium bromide	1·5 gms.
Water, up to	... 1,000 ccs.

Time. 3 to 8 minutes at 65° F.

Developer recommended for the " Special Fine-grain " 35 mm.

Metol	1 gm.
Sodium sulphite (anhyd.) ...	30 gms.
Glycin	0·5 gms.
Hydroquinone	0·5 gms.
Sodium carbonate (anhyd.) ...	25·0 gms.
Potassium bromide	1·5 gms.
Citric acid	1·0 gms.
Water, up to	... 1,000 ccs.

Time. 10 to 12 minutes at 65° F.

Developers for Positive films.

	Titles and Contrast	Softer results.
Metol	None	0·5 gms.
Sodium sulphite (anhyd.) ...	25·0 gms.	50·0 gms.
Hydroquinone	10·0 gms.	5·0 gms.
Sodium carbonate (anhyd.) ...	100·0 gms.	30·0 gms.
Potassium bromide	3·0 gms.	1·5 gms.
Citric acid	None.	1·0 gms.
Water, up to	1,000 ccs.	1,000 ccs.

Time. Averaging 4 to 5 minutes at from 60° to 65° F.

Formulæ and procedure for the Reversal process.

First development.

Solution No. 1.	Hydroquinone	10·0 gms.
	Sodium sulphite (anhyd.) ...	70·0 gms.
	Sodium carbonate (anhyd.) ...	35·0 gms.
	Potassium bromide	8·0 gms.
	Sodium hyposulphite	2·0 gms.
	Water, up to	... 1,000 ccs.
Solution No. 2.	Caustic potash (KHO) stick ...	100·0 gms.
	Water, up to	... 1,000 ccs.

The separate solutions are said to keep indefinitely. The working developer is made from 9½ parts of solution No. 1 mixed with one-half part of solution No. 2.

Washing. For 5 minutes.

Reversal (removing silver image.)

Stock solution.	Potassium bichromate	... 30 gms.
	Sulphuric acid (66° Be)	... 33 ccs.
	Water, up to	... 1,000 ccs.

Note Bichromate is dissolved first and the **acid is added to the water**; if the water is added to the acid there is **considerable** risk.

This section of the process is carried out in one part of the stock solution diluted with 5 parts of water, and is continued until all traces of the black silver deposit is dissolved away. This usually takes place in 5 to 10 minutes. After approximately 2 minutes the operation is continued in white light—not more than 30 to 60 watts of half-watt light at about 3 feet distance. Excessive light will produce too warm a tone in the final positive.

Washing.	For 5 minutes.	
Bleaching.	In a 10 per cent. solution of anhydrous sodium sulphite. The bath may be used until exhausted. All traces of yellow stain should disappear in this bath.	
Washing.	For 5 minutes.	
Second development	Metol	2 gms.
	Sodium sulphite (anhyd.)	... 50 gms.
	Hydroquinone	5 gms.
	Sodium carbonate (anhyd.)	... 30 gms.
	Potassium bromide	1½ gms.
	Water, up to	... 1,000 ccs.

Treatment in this bath is stopped as soon as the desired density is obtained.

Fixing.	In an ordinary acid-fixing bath for 5 minutes.
Washing.	Thoroughly for half-an-hour.

Ilford Limited.

The Cine products of this Company are classified below.

The list comprises a full range of 35 m/m. materials to meet all the requirements of the trade, together with a comprehensive variety of sub-standard lines.

Ilford Limited is always prepared to consider the preparation of special materials for special purposes and will welcome any requests of this nature.

ILFORD ORTHOCHROMATIC CINE NEGATIVE.

A high speed orthochromatic stock possessing a very fine grain and high resolving power. This emulsion can be recommended for every purpose where red sensitivity is not an essential. It is supplied on clear base.

ILFORD HYPERSENSITIVE PANCHROMATIC CINE NEGATIVE.

This is a super-speed panchromatic emulsion of very fine grain and high green and red sensitivity. Being double coated, the emulsion possesses great latitude. It is supplied on clear or anti-halo base. The following are the filter factors to daylight and half-watt light for various Ilford Filters :—

Filter	Tricolour. Blue,	Green,	Red.	Alpha,	Beta,	Gamma,	Iso,	Delta.
Daylight	6·5	5·5	4·5	1·4	1·7	3·2	1·5	2·0
½-watt light	10	5	2	1·1	1·3	2·4	1·2	1·3

Ilford Negative emulsions will give excellent results with any of the usual negative developers. The following is specially recommended :—

Metol	20 gms.
Hydroquinone	50 gms.
Sodium sulphite (anhyd.)	1,000 gms.
Borax	20 gms.
Water to	10 litres.

Time of development 10-20 minutes at 65° F.

ILFORD INFRA-RED CINE NEGATIVE.

For haze penetration and to obtain night effects during the day. This stock must be used in conjunction with the special Infra-Red Filter issued by Ilford Limited, and can be handled only in darkness or in the light of the special Ilford Infra-Red Safelight.

ILFORD CINE POSITIVE FILM.

This can be supplied on either acetate or nitrate base. It may be obtained in any of fourteen tints. The clear sound track which is a special feature of this tinted stock ensures that there will be no complications from the point of view of sound reproduction.

This is an extremely fine-grained emulsion of excellent photographic quality. The gradation is exceptionally good and the quality uniform.

The following developer is recommended, but any of the normal variants may be used with success. Any desired gradation may readily be obtained by varying the time of development.

Metol	3 gms.
Sodium sulphite (anhyd.)	400 gms.
Hydroquinone	60 gms.
Sodium carbonate (anhyd.)	190 gms.
Potassium bromide	9 gms.
Citric acid	7 gms.
Potassium metabisulphite	15 gms.
Water to	10 litres.

Normal time of development 5-7 minutes at 65° F.

ILFORD DUPLICATING STOCK.

Master Positive.—Suggested developer as for Positive stock.

Duplicating Negative, Series I.—Suggested developer as for Cine Panchromatic Negative.

Non-Stress Duplicating Negative, Series II (high gamma).—Suggested developer as for Cine Panchromatic Negative. This material possesses qualities both photographic and mechanical far in advance of material hitherto available. By means of a special non-stress coating, it has been possible to ensure that this delicately balanced emulsion will stand up to handling and processing without risk of abrasion or marking of any sort.

All the above are supplied with negative perforations.

ILFORD SOUND RECORDING FILM.

Sound Recording Negative, Type I.—This emulsion is suitable for sound recording by all existing systems. Where variable density (straight line) recording is concerned development is in a half-strength M.Q. Borax negative bath. For variable area and variable density (toe) recording, development should be in a normal positive bath.

ILFORD SUB-STANDARD CINE FILM.

16 m/m. Hypersensitive Panchromatic Negative.
Fine Grain Panchromatic Negative.
Panchromatic Reversal.
Black-and-White Positive.
Duplicating Negative.
(16 m/m. Negative and Positive Film can be supplied perforated on one side only for sound.)

9·5 m/m. Reversal Cine Film.

Other products likely to be of interest to the cine trade include filters, safelights, and neutral densities and wedges suitable for all sensitometric purposes.

Kodak Limited.

Following is a list of the various products of this company, and together with them the gamma value to which it is considered normal practice to develop each particular stock. These gamma values are obtained from time-scale sensitometric exposures, the instrument used being the Eastman Type 2B Sensitometer.

Super-X Panchromatic. Grey base.	Extreme speed panchromatic negative. Soft gradation. Gamma 0·65—0·7.
Super-sensitive Panchromatic. Grey-base or ivory base.	High speed panchromatic negative with soft gradation. Gamma 0·65.
Background panchromatic.	Gamma 0·65—0·7.
Orthochromatic negative.	Gamma 0·7.
Sound Recording film	Gamma 0·4 and 2·0 to 2·40
Positive	Gamma 2·0 to 2·40.

In B. & W. and 11 colours—Sonochrome.

Duplicating Positive.	Gamma 1·8 to 2·2.
Duplicating Negative.	Gamma 0·50 to 0·7.

Developer. Eastman Fine-grain Motion picture Developer No. D76.

Suitable for all negative stocks. : in use by a large number of film processing laboratories in England and the U.S.A. subject to slight modifications depending on the continuous plant in use. In a diluted form is used for variable-density recording development.

Metol	2·0 gms.
Sodium sulphite (anhyd.) ...	100·0 gms.
Hydroquinone	5·0 gms.
Borax	2·0 gms.
Water, up to	... 1,000 ccs.

Developer. Positive type No. D 16.

Suitable for the processing of positive stocks, including that of sound track using the variable area system of recording. It is further stated that slight modifications are called for with different types of continuous plant.

Metol (Elon.)	0·3 gms.
Sodium sulphite (anhyd.) ...	40·0 gms.
Hydroquinone	6·0 gms.
Sodium carbonate (anhyd.) ...	19·0 gms.
Potassium bromide	0·9 gms.
Citric acid	0·7 gms.
Potassium metabisulphite ...	1·5 gms.
Water, up to	... 1,000 ccs.

Pathéscope Limited.

9.5 mm. Film Stocks.

Panchromatic Super Speed Fine Grain (P.S.P.F.)	A 9.5 mm. direct reversal stock. It can also be used as a negative for contact printing.
Rapid Orthochromatic Fine Grain (R.O.F.)	A 9.5 mm. direct reversal stock. It can also be used as a negative for contact printing, or for titles by direct reversal or as a negative.
Negative	For straight negatives for contact printing, or for titles when half-tones are required.
Positive	For making contact prints, or for straight titles.

Para-phenylene Development.
Potassium Bichromate Reversal.

FIRST DEVELOPMENT.

Sodium sulphite (anhyd.)	20 gms.
Para-phenylene-diamine	10 gms.
Potassium bromide	4 gms.
Water...	1 litre
Caustic soda per litre	20 c.c.s. (liq.)
Alternatively	8 gms. (solid)

Developer should be used at 62-64 degs. Fahrenheit.

After first development wash 7-10 minutes.

All solutions other than the first developer should be used at 60-62 deg. Fahrenheit.

REVERSAL.

Potassium bichromate	5 gms.
Water...	1 litre
Sulphuric acid (conc. 66° Baumé)... ...	10 c.c.s.
Duration	5–7 minutes
Wash	1–2 minutes

BLEACHING.

Sodium sulphite (anhyd.)	20 gms.
Water...	1 litre
Caustic soda...	2 c.c.s.
Duration	2–3 minutes

Manipulate frame for even light action. Sensitivity is such that ordinary half-watt light is sufficient.

BLACKENING.

Metol	2 gms.
Hydroquinone	10 gms.
Sodium sulphite (anhyd.)	75 gms.
Potassium carbonate	25 gms.
Potassium bromide	2 gms.
Water...	1 litre
Duration	approx. 3 mins.
Wash	10 minutes

NOTE.—Efficient washing at this stage is essential for good colour if it is intended to follow with reduction by potassium permanganate. This is due to absorption of sodium sulphite which is present in concentrated state in the blackening bath.

FIXING.

After bleaching, the film may either be transferred direct to a normal acid fixing bath when density is satisfactory, or washed (with due regard to note above) and treated in :—

Potassium permanganate	2 gms.
Water...	1 litre

and thence transferred, after a brief immersion, to

Soda bisulphite lye	40 c.c.s.
Hypo	20 gms.
Water...	1 litre
Duration	7–10 minutes
Wash	10–15 minutes

Should there not be any reduction treatment after blackening normal acid fixing bath should be followed by a washing of 20 minutes' duration.

NORMAL ACID FIXING BATH.

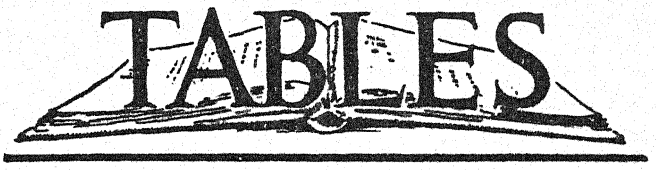
Water...	1 litre
Hypo	250 gms.
Soda bisulphite lye	20 c.c.s.

Perutz.

The following stocks are available, all characterised by an extreme fineness of grain. No developer formulæ are given with the exception of the proprietary numbers below—it is stated that these films will give excellent results with normal cine processing.

Stock No.	Type.	Special Characteristics.
701	Perorto negative.	Normal speed negative with orthochromatic qualities.
702	Neo-Persenso negative.	High speed orthochromatic.
703	Special Non-halation Aviation negative.	Normal speed orthochromatic with reduced sensitivity to blue, contrasty in quality suitable for aerial work as its name implies.
704	Peromnia negative.	High speed panchromatic type, antihalation backing, with rectepanchromatic sensitisation.
705	Rectepan negative.	Normal speed panchromatic type. Double coated and anti-halation.
712	Rectepan sub-standard 16 mm.	Suitable for either negative—positive or reversal processes. Normal speed panchromatic.
713	Rectepan sub-standard 9·5 mm.	As above, for 16 mm. gauge. Both on safety base.

Developers recommended. Perinal Nos. 94 and 194.
Compensating types. Nos. 40 and 140.



Tables in Past Almanacs.

The following is a list of tables which have appeared in past issues of the "Almanac," but are not included among those in the present volume.

The reference in brackets after each is to the most recent issue of the "Almanac" in which the table has appeared: in most cases it will be found included for several years prior to the date of this reference.

Chemical.

Simplification of Emulsion Calculations (Equivalence of Alkaline Haloid Salts). (1903, p. 1160.)

Solubility of the Silver Haloids.—Valenta. (1907, p. 1109.)

Freezing Mixtures. (1907, p. 1116.)

Developing Equivalence of the Alkalis. (1903, p. 1159.)

Chemical Reactions of the known Developing Agents (Tests of Developers). (1904, p. 1010.)

Pyro Developers recommended for various Plates by Makers. (1890, p. 666.)

Tables of Developers (in grains per oz.) for various Commercial Plates. (1912, p. 761.)

Formulæ of Chemicals. (1924, p. 483.)

Solubilities of Chemicals. (1924, p. 489.)

Poisons and Antidotes. (1927, p. 449.)

Light and Exposure.

Variation in the Sun's Position at Different Seasons of the Year.—J. A. C. Branfil. (1903, p. 1176.)

Points of the Compass at which the Sun rises for London, Edinburgh and Dublin. (1869, p. 147.)

Sun's Altitude for various Latitudes. (1898, p. 1063.)

Exposure and Lens Aperture. (1910, p. 893.)

Actinograph Exposure Table. (1901, p. 702.)

Comparative Exposures.—W. K. Burton (1887, p. 341.)

Comparative Plate-Speed Numbers. (1912, p. 897.)

Orthochromatic.

Speeds and Colour Sensitiveness of various Plates to Different Lights. Eder. (1907, p. 1115.)

Wave-Lengths of the Principal Fraunhofer Spectrum Lines, and the Elements that give them. (1905, p. 1144.)

Reflection of Light from various Surfaces. (1900, p. 1016.)

Optical.

Equations relating to Foci, etc.—Branfil. (1907, p. 1120.)

Combining Lenses.—Formulæ. (1910, p. 893.)

Perspective—Factors. (1910, p. 895.)

Correction of Convergent Distortion.—Formulæ. (1910, p. 896.)

Scale of Image. (1910, p. 893.)

Conjugate Foci. (1910, p. 892.)

Royal Photographic Society's Standard Diaphragms. (1903, p. 1178; 1905, p. 1149 and 1907, p. 1093.)

Uniform System Numbers for Stops from f/1 to f/100. (1905, p. 1147.)

Continental Stops and their U.S. Equivalents. (1907, p. 1127.)

Correction for Inconstancy of Aperture. (1910, p. 895.)

Angles and Foci of the Telephoto Lens. (1894, p. 949.)

Steinheil's Tables of Camera Extensions, etc., corresponding to a given Magnification of the Telephoto Lens. (1902, p. 732.)

Focussing with Pinhole Apertures. (1896, p. 954.)

Aperture Markings of Old Lenses. (1927, p. 457.)

View Angles. (1927, p. 458—459.)

Distances for Cine Projection. (1935, p. 427.)

EXPOSURE.

The following table, based on that originally compiled by W. K. Burton, gives a general idea of the exposures for various subjects. They are correct for the best lighting, mid-day summer sunshine, and modern rapid plates or films, about 700 H. & D., or 24 or 25 Scheiner.

In weather other than bright sunshine the exposures should be multiplied by :—

Bright diffused light	2
Dull, moderately heavy clouds ...	3
Very dull, dark clouds	4 to 5

A preferable method is to test the light by means of a meter of the actinometer type.

TABLE I.

F/ No.	Average Subject with objects in Foreground. Street Scenes. Outdoor Figure Studies.	Landscapes with Light Foreground, Lake, River and Beach Scenes.	Sea Clouds and Sky.	Subjects with Extra Heavy Foreground, *e.g.*, Dark Trees, Doorways, Groups.	Under Trees, Woods, Avenues, Glades, etc.	Portrait in Average Well-lighted Room.
f/2	1/1000	—	—	1/500	1/60	1/30
f/2·5	1/640	—	—	1/320	1/40	1/20
f/3·5	1/320	1/500	—	1/160	1/20	1/10
f/4·5	1/200	1/320	—	1/100	1/12	1/6
f/6·3	1/100	1/160	—	1/50	1/6	1/3
f/8	1/64	1/100	1/300	1/32	1/4	1/2
f/11	1/32	1/50	1/200	1/16	1/2	1
f/16	1/16	1/25	1/100	1/8	1·0	2·0

Daily Variation in Light for different Latitudes.

At other hours of the day and times of the year the above exposures are multiplied by the numbers in Table II. of daylight variation. The figure 1 in Table II. indicates times for which Table I. suffices by itself. Table II. has been worked out for the ALMANAC by R. de B. Adamson, B.Sc., of Christchurch, N.Z.

All the factors given are for atmospheric conditions as on a clear day in England. Extreme N. of Scotland, Lat. 60° ; S. of Scotland, N. of England, N. of Ireland, Lat. 55° ; S. of England, S. of Ireland, Lat. 50°.

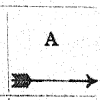
TABLE II.

Latitude.	North Hemisphere.	Morning. 12	11	10	9	8	7	6	5	4	South Hemisphere.
60°	June	1	1	1	1½	1½	2	3	4	8	December
	May, July	1	1	1½	1½	1½	2	3	6	10	Jan., Nov.
	April, Aug.	1⅓	1½	1½	1½	2	3	6	—	—	Feb., Oct.
	Mar., Sept.	1½	1½	2	2	3	6	—	—	—	Mar., Sept.
	Feb., Oct.	3	3	3	6	—	—	—	—	—	April, Aug.
	Jan., Nov.	4	6	8	—	—	—	—	—	—	May, July
	December	6	8	—	—	—	—	—	—	—	June
55°	June	1	1	1	1	1½	2	3	4	—	December
	May, July	1	1	1	1½	1½	2	3	6	—	Jan., Nov.
	April, Aug.	1	1½	1½	1½	2	3	6	—	—	Feb., Oct.
	Mar., Sept.	1½	1½	1½	2	3	6	—	—	—	Mar., Sept.
	Feb., Oct.	2	2	3	4	8	—	—	—	—	April, Aug.
	Jan., Nov.	3	3	4	8	—	—	—	—	—	May, July
	December	4	4	6	—	—	—	—	—	—	June
50°	June	1	1	1	1	1½	2	3	6	—	December
	May, July	1	1	1	1½	1½	2	3	8	—	Jan., Nov.
	April, Aug.	1	1	1½	1½	2	3	6	—	—	Feb., Oct.
	Mar., Sept.	1½	1½	1½	1½	3	6	—	—	—	Mar., Sept.
	Feb., Oct.	2	2	2	3	6	—	—	—	—	April, Aug.
	Jan., Nov.	3	3	3	6	—	—	—	—	—	May, July
	December	3	4	6	—	—	—	—	—	—	June
40°	June	¾	¾	1	1	1½	2	3	—	—	December
	May, July	¾	1	1	1	1½	2	4	—	—	Jan., Nov.
	April, Aug.	1	1	1	1½	1½	3	6	—	—	Feb., Oct.
	Mar., Sept.	1	1	1½	1½	2	4	—	—	—	Mar., Sept.
	Feb., Oct.	1½	1½	1½	2	4	—	—	—	—	April, Aug.
	Jan., Nov.	1½	2	2	3	6	—	—	—	—	May, July
	December	2	2	3	4	8	—	—	—	—	June
30°	June	¾	¾	1	1	1½	2	4	—	—	December
	May, July	¾	¾	1	1	1½	2	6	—	—	Jan., Nov.
	April, Aug.	¾	1	1	1½	1½	3	8	—	—	Feb., Oct.
	Mar., Sept.	1	1	1	1½	2	4	—	—	—	Mar., Sept.
	Feb., Oct.	1	1	1½	1½	3	6	—	—	—	April, Aug.
	Jan., Nov.	1½	1½	1½	2	4	—	—	—	—	May, July
	December	1½	1½	1½	2	4	—	—	—	—	June
15°	June	¾	¾	1	1	1½	3	8	—	—	December
	May, July	¾	¾	1	1	1½	3	—	—	—	Jan., Nov.
	April, Aug.	¾	¾	1	1	1½	3	—	—	—	Feb., Oct.
	Mar., Sept.	¾	¾	1	1½	1½	3	—	—	—	Mar., Sept.
	Feb., Oct.	1	1	1	1½	2	4	—	—	—	April, Aug.
	Jan., Nov.	1	1	1½	1½	2	6	—	—	—	May, July
	December	1	1	1½	1½	3	6	—	—	—	June
0°	May, June, July, Nov., Dec., Jan.	¾	1	1	1½	2	4	—	—	—	May, June July, Nov. Dec., Jan.
	Other months	¾	¾	1	1	1½	3	—	—	—	Other months
		12	1	2	3	4	5	6	7	8	
		Afternoon.									

Shutter Speeds for Moving Objects.

From the "Wellcome Exposure Calculator and Diary."

The table below is so calculated as to give in round figures the shutter speeds necessary for various moving objects, using the ordinary quarter-plate lens *of about 5 inches focus.* Column D is for objects moving towards or away from the operator, O is for objects moving obliquely towards or from the camera, that marked A, for objects moving directly across the field of view. Similar considerations apply to speed work as to depth of field and the maximum permissible exposure is such that the shift of the image on the photograph is not greater than the diameter of the permissible circle of confusion. This diameter depends upon the conditions which are discussed elsewhere in this Almanac under the heading of hyperfocal distance. For contact prints to be viewed in the hand, the diameter is conveniently taken as 1/100 in., and the table below is based upon this circle of confusion. If the photographs are to be enlarged it is better to give ½ to ⅓ these exposures, or to work further from the object. *The figures are no guide to the correct exposure for the plate.*

Distance of Object, 25 ft., unless otherwise stated. If 50 ft., exposure may be doubled; if 100 ft., quadrupled.	 D	 O	 A
Pedestrians (four miles per hour) ...	1/40	1/80	1/120
Vehicles (six miles per hour) ...	1/60	1/120	1/180
Vehicles (eight miles per hour) ...	1/80	1/150	1/250
Cyclists and trotting horses	1/160	1/300	1/500
Foot races and sports...	1/240	1/500	1/700
Divers	—	1/600	1/800
Cycle races, horse galloping	1/300	1/750	1/900
Yachts (10 knots) at 50 ft.	1/60	1/120	1/180
Steamers (20 knots) at 50 ft.... ...	1/120	1/240	1/360
Trains (30 miles per hour) at 50 ft. ...	1/150	1/300	1/450
Trains (60 miles per hour) at 50 ft. ...	1/300	1/600	1/900

In practice it may not be possible to attain this theoretical standard, in which case it should be remembered that the appearance of blurring is obviously the visible record of the actual distance the object has moved in the time the shutter has remained open. This distance, in inches, is to a sufficient approximation 20 times the speed of the object in miles per hour multiplied by the shutter speed in seconds.

Example: Speed of object 60 m.p.h.; shutter speed 1/100 sec.

$$\text{Distance moved} : 60 \times 20 \times \frac{1}{100} = 12 \text{ ins.}$$

WEIGHTS AND MEASURES.

Metric Weights and Measures.

In accordance with past practice, and because we believe that the majority of our readers are still accustomed to work in British measure, we give all formulæ in this Almanac in grains and ounces, the metric quantities necessary to make up a solution of equal strength being given in brackets. Since, however, there is a large and certainly increasing number who work in the far more simple and convenient metric measure we have this year included complete conversion tables and factors to enable British measure to be converted to metric. As space is limited, this has necessitated a certain abridgment of both sets of tables, but we hope that the slight extra trouble that may in certain cases be thereby entailed will be outweighed by the increased utility of the tables to a larger number of readers.

British and Metric Equivalents.

LINEAR MEASURE.

Inch	= 25·399	mm.	Millimetre	= 0·03937	in.
,,	= 2·5399	cm.	Centimetre	= 0·3937	in.
,,	= 0·0254	M.	Metre	= 39·3908	ins.
Foot	= 0·3048	M.	,,	= 3·2808	ft.
Yard	= 0·9143	M.	,,	= 1·0936	yd.
Mile	= 1609·3	M.	Kilometre	= 1093·6	yds.

SQUARE MEASURE.

Sq. inch	= 6·45	sq. cm.	Sq. cm.	= 0·155	sq. in.
,,	= 645	sq. mm.	Sq. mm.	= 0·00155	sq. in.
Sq. foot	= 0·0929	sq. M.	Sq. M.	= 10·737	sq. ft.
Sq. yard	= 0·836	sq. M.	,,	= 1·196	sq. yd.

WEIGHT.

Grain	= 65	mg.	Milligramme	= 0·015	gr.
,,	= 0·0648	gm.	Gramme	= 15·432	gr.
Ounce	= 28·35	gm.	,,	= 0·0353	oz.
Pound	= 453·57	gm.	Kilogramme	= 35·27	ozs.
			,,	= 2·2046	lbs.

VOLUME.

Minim	= 0·059	c.c.	C.c. = 16·9 minim
Drachm	= 3·55	c.c.	,, = 0·28 dr.
Ounce	= 28·4	c.c.	,, = 0·035 oz.
Pint	= 568·25	c.c.	Litre = 35 ozs. 1 dr. 34 minims
Gallon (160 ozs.)	= 4·546	L.	= 16894·1 minims

20 standard drops (3 mm. diam.) = 1 c.c. at 15°C.

British Weights and Measures.

1. APOTHECARIES WEIGHT.

20 Grains = 1 Scruple.
3 Scruples = 1 Drachm = 60 Grains.
8 Drachms = 1 Ounce = 480 Grains.

It is now customary in formulæ to employ the avoirdupois ounce (437½ grains), but where "drachms" are given the apothecaries drachm of 60 grains is meant.

2. AVOIRDUPOIS WEIGHT.

437½ Grains = 1 Ounce.
16 Ounces = 1 Pound = 7,000 Grains.
¼ ounce = 109 grains; ½ ounce = 219 grains; ¾ ounce = 328 grains.

3. FLUID MEASURE.

60 Minims = 1 Drachm.
8 Drachms = 1 Ounce = 480 Minims.
20 Ounces = 1 Pint = 160 Drachms = 9,600 Minims.
2 Pints = 1 Quart = 40 Ounces = 320 Drachms.
4 Quarts = 1 Gallon = 160 Ounces = 1,280 Drachms.

1 fluid ounce of water weighs 437½ grains, therefore every minim weighs 0·91 grain.

In the United States the pint is 16 ozs., the quart 32 ozs.

Conversion Tables.

Inches and Millimetres.

FRACTIONS OF INCHES INTO MILLIMETRES.

Inches.	Millimetres.	Inches.	Millimetres.
1	25·4	3/8	9·5
15/16	23·8	11/32	8·7
9/10	23·0	5/16	7·9
7/8	22·2	9/32	7·1
13/16	20·6	1/4	6·4
3/4	19·1	7/32	5·6
11/16	17·5	3/16	4·8
5/8	15·9	1/8	3·2
9/16	14·3	5/32	2·4
1/2	12·7	1/16	1·6
7/16	11·1	1/32	0·8

MILLIMETRES INTO INCHES AND DECIMALS.

Millimetres.	Inches.	Millimetres.	Inches.
1	0·04	15	0·59
2	0·08	16	0·63
3	0·12	17	0·67
4	0·16	18	0·71
5	0·20	19	0·75
6	0·24	20	0·79
7	0·28	21	0·83
8	0·31	22	0·87
9	0·35	23	0·90
10	0·39	24	0·94
11	0·43	25	0·98
12	0·47	25·4	1·0

Inches to Centimetres.

Inches.	Centimetres.	Inches.	Centimetres.	Inches.	Centimetres.	Inches.	Centimetres.
1	2·54	6	15·24	11	27·94	16	40·64
2	5·08	7	17·78	12	30·48	17	43·18
3	7·62	8	20·32	13	33·02	18	45·72
4	10·16	9	22·86	14	35·56	19	48·26
5	12·70	10	25·40	15	38·10	20	50·80

For conversion from centimetres to inches it is convenient to use the above table for millimetres to inches, reading centimetres for millimetres and moving the decimal point of the inch equivalent one place to the right.

English Plate Sizes to Metric Measure.

Inches.	Cm.	Inches.	Cm.
3¼ × 2½	8·9 × 6·4	7 × 5	17·8 × 12·7
3½ × 3¼	8·25 × 8·25	8½ × 6½	21·5 × 16·5
4¼ × 3¼	10·8 × 8·25	10 × 8	25·4 × 20·3
5 × 4	12·7 × 10·1	12 × 10	30·4 × 25·4
6½ × 4¾	16·5 × 12·0	15 × 12	38·1 × 30·4

Continental Sizes to British Equivalents.

Cm.	Inches.	Cm.	Inches.
3 × 4	1⅛ × 1⅝	10 × 15	3·92 × 5·9
4·5 × 6·0	1¾ × 2⅜	12 × 16	4·72 × 6·30
6 × 9	2¼ × 3½	13 × 18	5·12 × 7·08
9 × 12	3½ × 4¾	18 × 24	7·08 × 9·44

Ounces (Avoirdupois) and Fractions into Grains.
(Fractions of grains are omitted.)

¼ oz. = 109 grs.	2¼ ozs. = 984 grs.	4¼ ozs. = 1,859 grs.
½ oz. = 219 grs.	2½ ozs. = 1,094 grs.	4½ ozs. = 1,969 grs.
¾ oz. = 328 grs.	2¾ ozs. = 1,203 grs.	4¾ ozs. = 2,078 grs.
1 oz. = 437 grs.	3 ozs. = 1,312 grs.	5 ozs. = 2,188 grs.
1¼ oz. = 547 grs.	3¼ ozs. = 1,421 grs.	5¼ ozs. = 2,296 grs.
1½ oz. = 656 grs.	3½ ozs. = 1,531 grs.	5½ ozs. = 2,406 grs.
1¾ oz. = 765 grs.	3¾ ozs. = 1,640 grs.	5¾ ozs. = 2,516 grs.
2 ozs. = 875 grs.	4 ozs. = 1,750 grs.	6 ozs. = 2,625 grs.

Ounces (Avoirdupois) to Grammes.

Ozs.	Gms.	Ozs.	Gms.	Ozs.	Gms.
¼	7·09	5	141·75	13	368·54
½	14·17	6	170·10	14	396·89
¾	21·26	7	198·45	15	425·24
1	28·35	8	226·80	16	453·59
1½	42·5	9	255·15	17	481·94
2	56·70	10	283·5	18	510·29
3	85·05	11	311·85	19	538·64
4	113· 40	12	340·19	20	566·99

Cubic Centimetres to Fluid Ounces and Minims.

C.c.	Fl. oz.	minims.	C.c.	Fl. ozs.	Minims.
1	—	16·9	60	2	54
2	—	33·8	70	2	223
3	—	50·7	80	2	391
4	—	67·6	90	3	80
5	—	84·5	100	3	249
6	—	101	200	7	19
7	—	118	300	10	268
8	—	138	400	14	37
9	—	152	500	17	287
10	—	169	600	21	56
20	—	338	700	24	305
30	1	27	800	28	75
40	1	196	900	31	324
50	1	365	1,000 (1 litre)	35	94

Minims, Drachms and Fluid Ounces to Cubic Centimetres.

Mms.	C.c.	Mms.	C.c.	Dchms.	C.c.	Fl.ozs.	C.c.
1	0·059	15	0·888	2	7·10	5	142·1
2	0·118	20	1·18	3	10·66	6	170·5
3	0·178	25	1·48	4	14·21	7	198·9
4	0·237	30	1·77	5	17·76	8	227·4
5	0·296	35	2·07	6	21·31	9	255·8
6	0·355	40	2·37	7	24·87	10	284·2
7	0·414	45	2·66	1 oz.	28·42	20	568·4
8	0·474	50	2·96	2	56·84	30	852·6
9	0·533	55	3·26	3	85·26	40	1137
10	0·592	60 (1 drchm)	3·55	4	113·7	50	1421

Grammes into Grains.

(For fractional ounce equivalents of grains see p. 401).

Gms.	Grs.	Gms.	Grs.	Gms.	Grs.	Gms.	Grs.
0·1	1·5	6	92·6	20	308·6	90	1389
0·2	3·1	7	108·0	25	385·8	95	1466
0·3	4·6	8	123·4	30	463·0	100	1543
0·4	6·2	9	138·9	35	540·1	110	1698
0·5	7·7	10	154·3	40	617·3	120	1852
0·6	9·2	11	169·7	45	694·4	130	2006
0·7	10·8	12	185·2	50	771·6	140	2160
0·8	12·3	13	200·6	55	848·8	150	2314
0·9	13·9	14	216·0	60	926·0	160	2469
1	15·4	15	231·5	65	1003	170	2624
2	30·9	16	246·9	70	1080	180	2778
3	46·3	17	262·3	75	1157	190	2932
4	61·7	18	277·8	80	1235	200	3086
5	77·2	19	293·2	85	1312	250	3858

Grains into Grammes.

Grs.	Gms.	Grs.	Gms.	Grs.	Gms.
1	0·065	17	1·102	45	2·916
2	0·13	18	1·166	50	3·240
3	0·194	19	1·232	55	3·564
4	0·259	20	1·296	60	3·888
5	0·324	21	1·361	65	4·212
6	0·389	22	1·426	70	4·536
7	0·454	23	1·490	75	4·860
8	0·518	24	1·555	80	5·184
9	0·583	25	1·620	85	5·508
10	0·648	26	1·685	90	5·832
11	0·713	27	1·750	95	6·156
12	0·775	28	1·814	100	6·480
13	0·842	29	1·880	200	12·96
14	0·907	30	1·944	300	19·44
15	0·972	35	2·268	400	25·92
16	1·037	40	2·592	500	32·40

Formulæ Stated in Parts.

Formulæ given, as many are, in " parts," may be made up by writing gms. for the solid and c.c.s. for the fluid " parts," and converting them if necessary into the British measures by any of the

tables in this section. Thus: Pyro, 10 parts; sodium sulphite, 100 parts; water, 1000 parts, becomes Pyro, 154 grs.; sodium sulphite, 3 ozs. 230 grs.; water, 35 ozs.

Percentage Solutions.

To make a 10 per cent. solution 1 ounce avoirdupois—437½ grains is dissolved in sufficient water to make 4375 minims, or 9 ounces 1 drachm approximately. The object is to make the solution in such a form that every 10 minims will contain 1 grain of the solid. A corresponding metric solution is 10 grammes dissolved in 100 c.c.s.

Compound Conversion Factors and Tables for Converting Formulæ.

The most convenient method of converting the quantities stated in formulæ from British to metric and *vice versa* is by the use of the tables which follow. The conversion factors for weight per standard volume are given below: those for volume are amplified on the opposite page, following the British and metric conversion tables.

Compound Conversion Factors.

To convert:

Grammes per litre into grains per ounce. Multiply by 0·437.

Grains per ounce into grammes per litre. Multiply by 2·28.

C.C.s per litre into minims per ounce. Multiply by 0·48. (Or approximately, *divide* by 2.)

Minims per ounce into c.c.s per litre. Multiply by 2·1.

CONVERSION TABLES.

Grammes per Litre to Grains per 10 Ounces.

Grammes per Litre	Grains per 10 Ounces	Grammes per Litre	Grains per 10 Ounces	Grammes per Litre	Grains per 10 Ounces
1	4·4	11	48·1	30	131
2	8·8	12	52·5	40	175
3	13·1	13	56·9	50	219
4	17·5	14	61·2	60	262
5	21·9	15	65·6	70	306
6	26·2	16	70·0	80	350
7	30·6	17	74·4	90	393
8	35·0	18	78·8	100	437
9	39·4	19	83·1	200	875
10	43·8	20	87·5	300	1312

(For fractional ounce equivalents of grains see p. 401).

Grains (and fractional ounces) per 10 Ounces to Grammes per Litre.

Grains per 10 Ounces	Grammes per Litre	Grains per 10 Ounces	Grammes per Litre	Grains per 10 Ounces	Grammes per Litre
1	0·23	50	11·43	900	205·8
2	0·46	60	13·72	1000	228·6
3	0·69	70	16·00		
4	0·91	80	18·29	$\frac{1}{4}$ oz.	25
5	1·14	90	20·6	$\frac{1}{2}$	50
6	1·37	100	22·9	$\frac{3}{4}$	75
7	1·60	200	45·7	1	100
8	1·83	300	68·6	$1\frac{1}{4}$	125
9	2·06	400	91·5	$1\frac{1}{2}$	150
10	2·29	500	114·3	$1\frac{3}{4}$	175
20	4·57	600	137·2	2	200
30	6·86	700	160·0	$2\frac{1}{4}$	225
40	9·15	800	182·9	$2\frac{1}{2}$	250

Minims and Drachms per 10 Ounces to Cubic Centimetres per Litre.

To convert *minims per 10 ounces* to c.c.s per litre it is sufficiently accurate for all ordinary purposes to *divide minims by 5* (to be exact, 4·8).

To convert *drachms per 10 ounces* to c.c.s per litre, *multiply by 12* (to be exact, 12·5).

To convert *c.c.s per litre to minims per 10 ozs.* multiply by 5 (4·8).

To convert *c.c.s per litre to drachms per 10 ozs.* divide by 12 (12·5).

Comparison of Thermometer Scales.

To convert *Centigrade* to *Fahrenheit:*

Multiply by $\frac{9}{5}$ and then add 32.

To convert *Fahrenheit* to *Centigrade:*

Subtract 32 and then multiply by $\frac{5}{9}$.

OPTICAL CALCULATIONS.

Finding Focal Length.

The focal length of a lens may readily be found as follows: Focus carefully on some very distant object, such as a church spire, and mark the position of any convenient part of the moving lens front on the fixed baseboard of the camera. Then focus sharply on an object of known size, *e.g.*, a graduated rule, placed as close to the camera as the available bellows extension will permit. When this has been carefully focussed mark the position of the part of the lens front previously chosen, and then photograph the object. After development measure the length of its image.

If L is the length of the object and l the length of its image on the plate and d the distance between the two marks made on the baseboard, then the focal length of the lens is given by $d \times L \div l$.

This method is theoretically sound and only requires care to give accurate results.

If there is available a camera of extension somewhat greater than twice the focal length which is to be measured a similar method may be used. In this case the procedure is to focus as before on a distant object, marking the position of any convenient part of the moving lens front on the fixed camera baseboard. Then any small object is focussed so that the image is exactly the same size as the object, and the baseboard again marked. The distance between the two marks is the focal length of the lens.

Focal Distances, etc.

Throughout the formulæ, on the next page, the following symbols are used as follows:—

f = the focal length or "focus" of the lens.

u = the distance of the *object* from the lens.

v = the distance of the *image* from the lens, *e.g.*, camera extension in copying, lens-easel distance in enlarging.

D = distance from object to image, neglecting nodal space, which in most lenses, is small compared with D.

R = number of times that the size (linear) of the object divides into that of the image, *i.e.*, No. of times of enlargement.

r = number of times that the size (linear) of the image divides into that of the object, *i.e.*, No. of times of reduction.

The distances u and v are reckoned respectively from the admission and exit nodes of a lens. For practical purposes (except with telephoto lenses) it is near enough to take these as situated at the diaphragm of a compound lens or at the surfaces of a single lens.

All the formulæ are derived from the parent formula:

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

which, in its various forms, allows of practically any calculation of image or object size, scale of enlargement or reduction, camera extension, etc., being readily made.

Scale of Reproduction.

$R = \frac{\text{size of image}}{\text{size of object}}$ (linear) $\qquad r = \frac{\text{size of object}}{\text{size of image}}$ (linear)

R is No. of times of enlargement. $\qquad r$ is No. of times of reduction.

$$R = \frac{v}{u} \quad \ldots \quad \ldots \quad \ldots \ (1) \qquad r = \frac{u}{v} \quad \ldots \quad \ldots \quad \ldots \ (5)$$

$$R = \frac{f}{u-f} \quad \ldots \quad \ldots \quad \ldots \ (2) \qquad r = \frac{u-f}{f} = \frac{u}{f} - 1 \quad \ldots \ (6)$$

$$R = \frac{v-f}{f} \quad \ldots \quad \ldots \quad \ldots \ (3) \qquad r = \frac{f}{v-f} \quad \ldots \quad \ldots \quad \ldots \ (7)$$

$$R = \frac{D-2f}{f} \text{ (approx.)} \quad \ldots \ (4) \qquad r = \frac{D-2f}{f} \text{ (approx.)} \quad \ldots \ (8)$$

Focal Length.

$$f = \frac{u \times R}{R+1} = \frac{u}{r+1} \quad \ldots \ (9) \qquad f = \frac{D \times R}{(R+1)^2} = \frac{D \times r}{(r+1)^2} \quad (11)$$

$$f = \frac{v}{R+1} = \frac{v \times r}{r+1} \quad \ldots \ (10) \qquad f = \frac{D}{R+2} = \frac{D}{r+2} \quad (12)$$ (approx.)

$$f = \frac{u \times v}{D} \quad \ldots \quad \ldots \ (13)$$

Distance of Object from Lens.

$$u = \frac{v}{R} = v \times r \quad \ldots \quad \ldots \ (14) \qquad u = \frac{f \times v}{v-f} \quad \ldots \quad \ldots \ (16)$$

$$u = \frac{f}{R} + f = (r+1) \times f \ldots \ (15) \qquad u = \frac{D}{R+1} = \frac{r \times D}{r+1} \quad \ldots \ (17)$$

Distance of Image from Lens.

$$v = u \times R = \frac{u}{r} \ldots \quad \ldots \ (18) \qquad v = \frac{f \times u}{u-f} \quad \ldots \quad \ldots \ (20)$$

$$v = (f \times R) + f = \frac{f}{r} + f \ldots \ (19) \qquad v = \frac{R \times D}{R+1} = \frac{D}{r+1} \quad \ldots \ (21)$$

Object-Image Distance.

$$D = f \times (R + \frac{1}{R} + 2) = \qquad D = \frac{v \times (R+1)}{R} = v \times (r+1) \quad (25)$$

$$f \times (r + \frac{1}{r} + 2) \ldots \ (22) \qquad D = u \times (R+1) =$$

$$= \frac{f \times (R+1)^2}{R} = \frac{f \times (r+1)^2}{r} \ (23) \qquad \frac{u \times (r+1)}{r} \ \ldots \ (26)$$

$$= f \times (R+2) = f \times (r+2) \quad (24)$$ (approx.)

Notes on the Formulæ.

No. 2.—If the distance u of an object is very great relatively to the focal length f, the latter becomes negligible relatively to u, so that the formula becomes $R = \frac{f}{u}$ according to which the size of the image is directly proportional to f, and inversely proportional to u. While theoretically this is never so, the size of image is proportional (within an error of 1 per cent.) to the distance of the object if the distance of the object is at least 100 times the focal length of the lens. (See B.J., 1921, November 18, p. 686.)

Nos. 3, 7, 16.—When the distance u of the object is very great relatively to the focal length, the distance v of the image from the lens becomes nearly equal to f, and, in consequence of depth of focus, actually equal to f. In these circumstances corresponding with the photography of distant objects. Formulæ 3, 7 and 15 cease to apply.

Nos. 1, 2, 3, 5, 6, 7.—Bearing in mind the definitions of R and r these formulæ permit the calculation of the size of image obtained of an object of known size at a given distance with a lens of given focal length and, *vice versa*, the size of an object yielding an image of known size.

Nos. 4, 8, 12, 24.—These approximate formulæ yield results sufficiently near for practical purposes if R or r is greater than about 9 or 10.

No. 20.—If u is very great, compared with f, $u - f$ becomes practically equal to u, and therefore $v = f$.

Examples.

The following examples will serve to illustrate the use of those of the above formulæ which are chiefly employed for practical purposes :—

A picture 12 × 6 ft., 20 ft. from the lens is photographed with a 10 in. lens. What is the size of the copy ? 12 ft. = 144 ins. 20 ft. = 240 ins. From *Formula 2*, 144 × 10 ÷ (240 − 10) = 144 × 10 ÷ 230 = 6·26 ins. The copy therefore measures 6·26 × 3·13 ins.

Copying to Scale.

In making the copy of a painting on a scale of one-seventh, what focal length is required if the painting is 20 ft. distant. In *Formula* 9, u = 20 ft. $r = 7$. $r + 1 = 8$. The required focal length is therefore 20 ÷ 8 = 2½ ft. = 30 ins.

Enlarging with Camera.

Camera has extension of 14 ins. What is greatest degree of enlargement that can be obtained when using 4-in. lens ? 14 − 4 = 10 in. 10 ÷ 4 = 2½ ; that is, maximum enlargement is 2½ times (*Formula* 3).

Maximum Focal Length.

In a camera for copying-enlarging up to 4 times, an extension of 30 ins. (lens to plate) can be obtained. What is the maximum focal length of lens which can be used ? 4 + 1 = 5. 30 ÷ 5 = 6. (*Formula 10*). Maximum focal length is 6 ins.

In copying originals half scale with camera of 9 ins. extension what is maximum focal length of lens which can be used ? 9 × 2 = 18. 18 ÷ 3 = 6 ins. (*Formula 10.*) Focal length must not be greater than 6 ins.

Camera Extensions.

What is the required camera extension for copying $8\frac{1}{2} \times 6\frac{1}{2}$ ins. to $4\frac{1}{4} \times 3\frac{1}{4}$ ins. with a 12 in. lens? In *Formula 19*, reduction figure = 2. $12 \div 2 = 6$. $6 + 12 = 18$ ins.

What is the required camera extension when enlarging $4\frac{1}{4} \times 3\frac{1}{4}$ in. plate to $8\frac{1}{2} \times 6\frac{1}{2}$ ins. (= 2 times enlargement) with 12-in. lens? In *Formula 19*, $f = 12$; $R = 2$. $12 \times 2 = 24$. $24 + 12 = 36$ ins. = 3 ft.

Enlarging Space.

Enlargements up to 10 diameters are to be made with 8-in. lens. What space is required between negative and easel? In *Formula 23*, $R + 1 = 11$. $11 \times 11 = 121$. $121 \times 8 = 968$. $968 \div 10 = 96{\cdot}8$ ins. = 8 ft. $\frac{3}{4}$ in.

Studio Space.

For making full-length cabinet portraits with 12-in. lens, what distance is required between sitter and focussing screen? If sitter is 70 ins. and figure is 5 ins. on negative, $r = 14$. In *Formula 23*, $r + 1 = 15$. $15 \times 15 = 225$ ins. $225 \times 12 = 2{,}700$. $2{,}700 \div 14 = 192\frac{3}{4}$ = 16 ft. $\frac{3}{4}$ ins.

Magnifiers.

When using a supplementary lens (magnifier) as a means of bringing near objects into focus when employing a camera fitted with a lens adjusted for use at fixed focus, the focal length of the supplementary lens must be equal to the distance of the object. This holds good whatever the focal length of the original lens.

Altering Focal Length.

The rule (very rough, on account of the impossibility of knowing from which part of a lens mount to measure) for finding the focal length of an extra lens, to reduce or increase the focal length of a given lens is as follows:—

Multiply the focal length to be altered by the final focal length desired, and divide the product by the original focal length less the final focal length.

That is: $f_2 = \dfrac{f_1 \times F}{f_1 - F}$

where f_1 is the original focal length.

F the final focal length required, and f_2 the focal length of the necessary added lens.

To increase the focal length, use a negative lens.

To reduce the focal length, use a positive lens.

Telephoto Rules.

F = equivalent focal length of complete lens.

f_1 = equivalent focal length of positive.

f_2 = equivalent focal length of negative.

E = camera extension, from negative lens to ground glass.

M = magnification, that is, number of times the image given by the complete lens is larger than that given by positive alone.

Magnification when working at given extension is found by dividing camera extension by

focal length of negative lens and adding 1.

$$M = \frac{E}{f_2} + 1.$$

Camera extension, necessary for given magnification,—multiply focal length of negative lens by magnification less 1.

$$E = f_2 (M - 1).$$

Focal length of complete lens.—Multiply focal length of positive by magnification.

Diaphragm Numbers.

EXPOSURES AT DIFFERENT APERTURES.

F. Numbers ...	1·8	2	2·2	2·5	2·7	2·9 3	3·16	3·4
Rel. Exposure Required—								
Fractions ...	2/3	3/4	1	1¼	1½	1¾	2	2½
Decimal ...	0·83	1	1·33	1·66	2	2·33	2·66	3
Seconds ...	1/1200	1/1000	1/750	1/600	1/500	1/428	1/375	1/325

F. Numbers ...	3·5	3·9 4	4·5	5	5·6	6	6·3	8
Rel Exposure—								
Fractions ...	2½	3	4	5	6	7	8	12
Decimal ...	3·33	4	5·3	6·66	8	9·3	10·6	16
Seconds ...	1/300	1/250	1/190	1/150	1/125	1/100	1/95	1/60

The above table gives the relative exposures with lens apertures. The Fraction line gives a series of F/Nos. each requiring double the exposure of the preceding one. This series is F/2·2, 3·16, 4·5, 6·3. The Decimal line gives a similar series, beginning with *f*/2, viz., F/2, 2·7, 4, 5·6, 8. The last line gives the relative Speed of any lens, in comparison with another lens of different aperture.

EQUIVALENT F/- AND UNIFORM SYSTEM NUMBERS.

Rel. Exposure Req'd	1	2	4	8	16	32	64	128
F. Nos.	4	5·6	8	11·3	16	22·6	32	45·2
U.S. Nos.	1	2	4	8	16	32	64	128

Among Continental opticians at the present time it is usual to adopt a different series of F/Nos. each requiring double the exposure of the preceding one. This series is :—

F/No.	3·16	4·5	6·3	9	12·5	18	25·3	36

NOTE.—Most lenses are now marked with the F/Numbers, according to one of the above series. The actual diameter of the diaphragm aperture in millimetres is marked on some Continental lenses.

Lenses for Studios.

FOCAL LENGTHS OF LENSES FOR STUDIOS OF VARIOUS LENGTHS.

The following table shows the focus of lens which is suitable for comfortable working in studios of various lengths. In each case it is assumed that 5 ft. of the length will be taken up by camera, operator, sitter and background. The figures in column 1 are the full run of the studio, including this 5 ft. In the case of the short studios the focal lengths are about the longest which can be used: in the case of the longer studios somewhat greater focal lengths might be used, but the lenses directed in the table are about the best for general work.

Length of Studio. Feet.	C.D.V. full length. Inches.	C.D.V. half length and Cabinet full length. Inches.	C.D.V. head, Cabinet half length. Inches.	Cabinet head and Boudoir full length. Inches.	Boudoir half length, Panel full length. Inches.	Boudoir head, Panel half length. Inches.
12	4*	6½*	8½	9*	12*	14
14	4¾*	7½*	9	10*	13*	16
16	5¾	8½	10	10½	16	18
18	6	8½	10½	10½	16	18
20	6	10	10½	12	18	20
22	7	10½	12	14	22	22
24	8½	12	14	16	24	24
28	8½	13½	16	16	24	24
30	10	13½	16	18	24	24

* Full lengths may be obtained with these focal lengths, but the standpoint is so near to the sitter that good perspective cannot be expected.

Hyperfocal Distance and Depth of Focus.

An article on the Hyperfocal Distance and its use will be found in the body of this Almanac, which should be referred to for information on depth of field and kindred matters.

Strictly speaking there is no such thing as depth of field. A (hypothetical) perfect lens would give perfect definition only of objects situated in the plane for which it is focussed; if the object moves out of this plane, its image on the sensitive surface becomes degraded in definition. The use of the term "depth of field" therefore does not imply that perfect definition, or even the best definition of which the lens is capable, extends over the whole

space within that depth. It means that for ordinary use the degradation of definition within these limits does not become so pronounced as to be easily noticeable. The usual standard of definition is that when the picture is enlarged to such a size (about whole-plate) as to be properly viewed at 10 ins., the disc of confusion on the print representing a point of the object, shall not exceed 1/100 in. If the picture is subjected to closer scrutiny than this, lack of definition will be noticeable. And this is as it should be, for the object of depth of field tables is to allow the greatest latitude possible for ordinary picture making, not to provide for extraordinary work. The intelligent use of hyperfocal distance necessitates the user understanding the standard of definition he is working on, and knowing when he must adopt a higher standard by more drastic stopping down, in order to enable his negative to stand the closer scrutiny for which it is destined.

It is sometimes argued that as a 2 in. lens at *f*/8 has a H.D. of 21 ft., the miniature camera can be used at that stop focussed on that distance for everything beyond 10½ ft. This will not prove satisfactory; suppose a distant view is taken, the whole of it is on the verge of being noticeably out of focus. If there were a principal object at 21 ft. sharply defined, then a suspicion of lack of definition in the background would pass unheeded; but if that background becomes not a background but the principal object, best definition is required in it. The focus should always be set for the object of principal interest.

Table of Hyperfocal Distances.

Focal length, inches	Stops.											
	f/1	*f*/1·4	*f*/2	*f*/2·8	*f*/3·2	*f*/4	*f*/4·5	*f*/5·6	*f*/8	*f*/11	*f*/16	*f*/22
1	84	60	42	30	27	21	19	15	11	8	6	4
1½	125	89	63	45	40	32	28	23	16	11	8	6
2	168	119	84	60	53	42	37	30	21	15	11	8
2½	209	149	105	75	66	53	47	38	27	19	14	10
3	—	178	126	89	79	63	56	45	32	23	16	12
3½	—	208	147	104	92	74	65	53	37	26	19	13
4	—	—	168	119	105	84	75	60	42	30	21	15
4½	—	—	189	134	118	95	84	68	48	34	24	17
5	—	—	209	149	131	105	93	75	53	38	27	19
5½	—	—	—	163	145	116	103	82	58	41	29	21
6	—	—	—	178	158	126	112	89	63	45	32	23
6½	—	—	—	193	171	137	121	97	69	49	35	25
7	—	—	—	208	184	147	130	104	74	52	37	26

The standard of this table is a maximum disc of confusion in the negative of 1/1,000 of the focal length of the lens, which produces a disc of confusion of 1/100 in. in an enlargement for which the

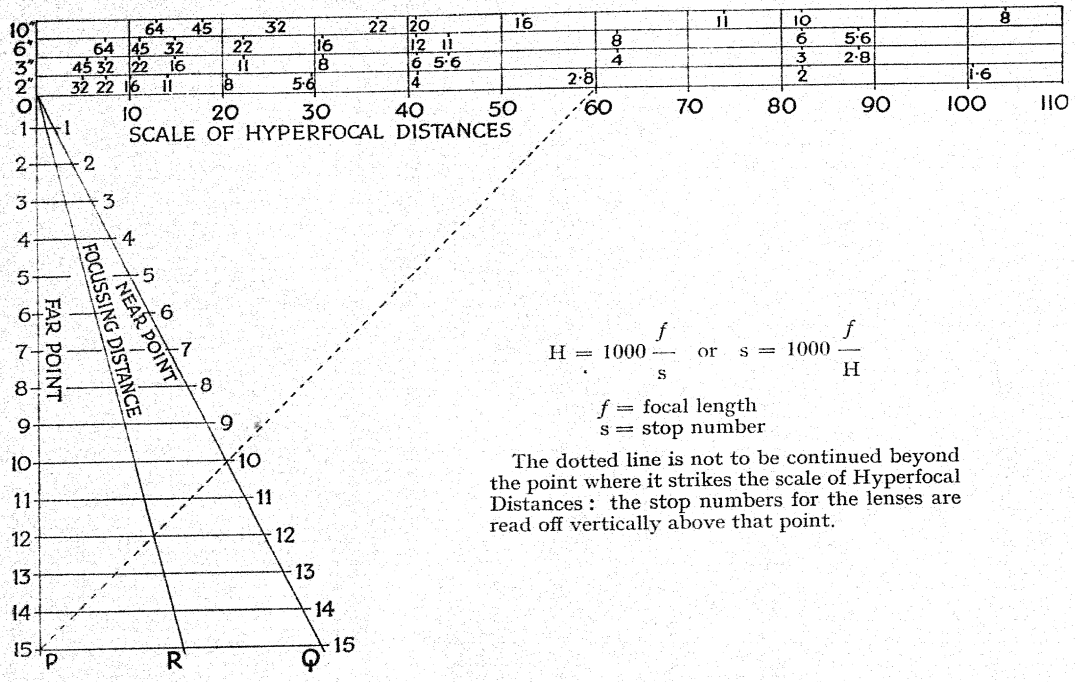
proper viewing distance is 10 ins. If a "two-power" telephoto lens is used these hyperfocal distances should be doubled, and similarly for other powers in proportion to the power. This standard of definition is that generally used and found satisfactory; the Leica standard is 1/1,500 focal length; if that standard should be preferred, the above hyperfocal distances must be increased by a half.

Optimum Focussing and Maximum Stop by Chart.

Dr. Hanney describes a graphical construction from which, when near and far limits of the field are given, may be read off not only the distance on which to focus but also the maximum stop that may be used. The far distance is measured along OP, but the near distance, although its end is marked on OQ, is measured as an ordinate parallel to OP. The middle line OR does not bisect the angle POQ as in the ordinary construction, but R bisects the line PQ. The tie-line gives the optimum focussing distance, also measured as an ordinate, where it cuts the middle line OR, and also gives the hyperfocal distance where it cuts the horizontal axis. The scale for H.D. is for convenience compressed in the ratio PR : OP, in the diagram, $\frac{1}{4}$. H being found from the graph, the formula $H = 1{,}000\frac{f}{s}$, or $s = 1{,}000\frac{f}{H}$, gives the maximum stop number permissible. But if the axis is scaled with the f/ numbers, even this calculation is avoided, and the stop number can be read directly from the graph. The chart is scaled for four focal lengths as examples, but it is easy to mark the scale with stop numbers for any lens. To find where the mark for $f/8$ should be placed for, say, a 4¾ in. lens, put $s = 8$ in the equation $H = 1{,}000\frac{f}{s}$ expressing the focal length in feet, H is 49·48 ft. Therefore $f/8$ is marked at 49½, $f/16$ at 24¾, $f/32$ at 12⅜, $f/64$ at 6¼, $f/4$ at 99 and $f/2$ at 198. Repeating the calculation for $f/11{\cdot}3$ instead of 8, we get 35, at which we enter $f/11$, $f/22$ at 17½, $f/45$ at 8¾, $f/5{\cdot}6$ at 70, $f/2{\cdot}8$ at 140.

The standard of definition assumed here for normal lenses (focal length approximately equal to diagonal of negative) is 1/100 in. in the enlargement when 10 ins. is the proper distance for viewing. The Leica standard is 1/150 in. at 10 ins.; if this standard is preferred, the chart may be scaled for it by using the coefficient 1,500 instead of 1,000 in the formula for H, or the graph may be used as it stands, and the stop numbers read off increased by 50 per cent. Any standard required may be attained by this method.

The diagram may be used for any multiple of the indicated feet, provided that the f/ number is divided by that multiple. Thus the dotted line on the chart indicates that for limits of 150 and 100 ft., the focussing distance is 120 ft., the H.D. 600 ft., and the stop



$$H = 1000\frac{f}{s} \quad \text{or} \quad s = 1000\frac{f}{H}$$

f = focal length
s = stop number

The dotted line is not to be continued beyond the point where it strikes the scale of Hyperfocal Distances: the stop numbers for the lenses are read off vertically above that point.

f/0·28 may be used on a 2 in. lens. Or for 1½ ft. and 1 ft. the focussing distance is 1·2 ft., H.D. 6 ft., and stop *f*/28. Or for limits of 30 ft. and 20 ft., the focussing distance is 24 ft., H.D. 120 ft. and maximum stop *f*/1·4.

The chart can also be used to give the limits of definition when the distance focussed on and the stop are known. The H.D. for a 3 in. lens at *f*/5·6 is 45 ft.; a line from 45 on the H.D. scale to 10 ft. focussing distance shows definition from 8¼ ft. to 13 ft. (B.J., 1936, Sept. 4, p. 559, and Sept. 25, p. 609.)

Depth Table for Amateur Cine Cameras.

CALCULATED FOR A LENS OF 1 INCH (25 mm.) FOCUS AND A DISC OF CONFUSION OF 0·001 INCH.

Distance focussed in feet.	f/1·9	f/2·8	f/3·5	f/4
100	30 – inf.	23 – inf.	19 – inf.	17 – inf.
50	23 – inf.	18 – inf.	16 – inf.	14 – inf.
25	16 – 38	13½ – inf.	12 – inf.	11 – inf.
15	11 – 22	10 – 30	9 – 40	8 – 55
10	8 – 13	7½ – 15	7 – 17	6¾ – 19
8	6¾ – 10	6⅓ – 11	6 – 12	5¾ – 13
6	5¼ – 7	5 – 7½	4¾ – 8	4⅔ – 8½
4	3¾ – 4½	3½ – 4⅔	3⅓ – 4⅔	3½ – 5
3	2′ 10″–3′ 2″	2′ 9″–3′ 4″	2′ 8″–3′ 5″	2′ 7″–3′ 6″
2	23″ – 25″	22½″–25½″	22″ – 26″	21½″– 27″

Distance focussed in feet.	f/5·6	f/8	f/11	f/16
100	13 – inf.	9 – inf.	7 – inf.	5 – inf.
50	11 – inf.	8½ – inf.	6½ – inf.	4¾ – inf.
25	9¼ – inf.	7⅓ – inf.	5¾ – inf.	4½ – inf.
15	7½ – inf.	6 – inf.	5 – inf.	3¾ – inf.
10	6 – 30	5 – inf.	4 – inf.	3½ – inf.
8	5¼ – 17	4½ – 36	3¾ – inf.	3¼ – inf.
6	4½ – 10	3⅔ – 14	3⅓ – 31	2¾ – inf.
4	3 – 5½	2¾ – 6½	2½ – 8¾	2¼ – 18
3	2′ 6″–3′ 9″	2′ 4″–4′ 6″	2′ 0″–5′ 0″	1¾ – 7
2	21″ – 28″	20″ – 30″	19″ – 33″	17″ – 40″

CHEMICALS.

Properties of Chief Chemicals Used in Photography.

On these pages are given particulars of just those chemicals which are used in everyday photography, with those of a few others not so regularly employed. The facts here collected are those which it is useful to know for the proper making-up of solutions: and they also enable photographers unacquainted with chemistry to identify chemicals by their different names. A few of the uses of some of the chemicals is briefly stated, in brackets, at the end of each paragraph.

Acetic Acid (CH_3COOH).—Sold as "glacial," which is the strength to be used in formulæ unless otherwise directed. The glacial acid is a liquid of sp. gr. 1·055, which strongly blisters the skin. At 50 deg. F. it solidifies to a mass of crystals. Thus in cold weather it may be necessary to melt the contents of a bottle of the acid before use by standing the bottle in warm water. Glacial acid absorbs water strongly from the air and must be kept well stoppered. It mixes in all proportions with water, alcohol, ether, chloroform and glycerine, and dissolves gelatine, celluloid, fat, oils, etc. In United States a No. 8 acid of 1·040 sp. gr. is commonly prescribed in formulæ, it is of 31 per cent. strength, *i.e.* about one-third the strength of the glacial acid. (Acidifying fixing baths.)

Acetone $(CH_3)_2CO$.—Colourless volatile liquid, much used as a solvent, e.g. celluloid, also in certain developers in place of alkali. Films should not be developed in any solution containing acetone since it causes the emulsion to become detached. Highly inflammable.

Albumen.—One of the protein colloid substances which largely compose living tissue, animal and vegetable. The typical albumen occurs in white of egg, which is the only animal albumen having any photographic use. Egg albumen is soluble in water and dilute solutions of alkalies and salts. Heated to about 163°F. it is irreversibly coagulated, becoming then amorphous and insoluble. The same effect is produced by strong alcohol, and by most metallic salts. The solution of egg-albumen is extremely liable to decompose and, if not used at once, requires to be preserved with an antiseptic. Invert albumen, which is soluble in alcohol, is prepared from egg albumen by treating first with acid and then alkali. Its use is now limited to process work, owing to the disuse of albumenised paper and of the albumen processes.

Alcohol.—Ordinary alcohol is ethyl alcohol (C_2H_5OH) which, when of sp. gr. 0·794, is "absolute alcohol" (=100 per cent.). Alcohol containing 10 per cent. water is "rectified spirit." Methylated spirit consists of rectified spirit plus 10 per cent. crude wood spirit (to render it undrinkable), one-eighth per cent. mineral naphtha,

½–1 per cent. pyridine and a trace of methyl violet to colour it. The naphtha appears as a milkiness when the spirit is mixed with water. Methylated spirit which has taken up water, e.g., from wet negatives or prints, can be largely dried by shaking with dry potassium carbonate. The latter takes up the water which forms a dense solution of it. The partially dried spirit, which takes up about 0·1 per cent. of the potass. carbonate, can afterwards be poured off. (Concentrated developers ; rapid drying ; cleaning.)

Alum.—Double sulphate of aluminium and potassium (or ammonium), *i.e.* potash alum or ammonia alum [$Al_2(SO_4)_3 . K_2SO_4 . 24H_2O$ or $Al_2(SO_4)_3 (NH_4)_2 SO_4 . 24H_2O$]. Potash alum is made in large white crystals, but is more conveniently dissolved if bought in powder form. Solubility 1 in 10 in cold water, very readily soluble in hot. Ammonia alum is not quite so soluble. Both alums dissolve in glycerine. Both are acid substances, decomposing hypo, with deposition of sulphur. Alum for photographic use should be free from iron, the presence of traces of which is liable to give rise to bluish stains in sulphide-toned prints which have been hardened in a bath containing impure alum. (Hardening bath.)

Amidol, *i.e.*, diaminophenol hydrochloride, $OH.C_6H_3.(NH_2)_2$. Fine white or bluish grey crystals, very soluble in water, but almost insoluble in alcohol. The solution is acid ; addition of sodium carbonate produces effervescence. Amidol in the dry state is slowly affected by air and light and should be kept in well stoppered yellow bottles. When preparing a developer, the amidol must be dissolved in a solution of sodium sulphite. It keeps only a short time and should be used on the day that it is made or not later than the following day.

Ammonia, *i.e.*, liquor ammonia, strong solution in water of the gas NH_3. Ammonia is sold as of sp. gr. 0·880, *i.e.*, strongest liquor ammonia, but is usually of somewhat less strength. The strong solution rapidly loses strength by exposure to the air. When purchasing a few ounces, it is well to mix with an equal bulk of water, using a double quantity of this half strength mixture in making up any formulæ. (Developer, in colour photography.)

Ammonium bichromate $(NH_4)_2 Cr_2O_7$.—Orange crystals, formed by neutralising chromic acid with ammonia. More soluble than the potash salt, 1 in 4 in cold water. It can replace pot. bichromate in the sensitising of gelatine in the carbon, carbro, and oil processes, and is frequently used in preference on account of its stronger action. It is also largely used for sensitising in photo-mechanical process work, especially in the half-tone processes.

Ammonium bromide, NH_4Br. White crystalline powder dissolving in 1½ times its weight of cold water ; slightly soluble in alcohol. It absorbs moisture from the air and should be kept well stoppered.

Ammonium carbonate, or rock ammonia. A mixture of ammonium bicarbonate and ammonium carbamate, sold in hard opaque pieces, smelling

strongly of ammonia. Any white powdery crust on the pieces should be scraped off before using. Dissolves in about four times its weight of cold water; should not be dissolved in hot water.

Ammonium chloride, NH_4Cl. A commercial quality is the sal ammoniac sold for batteries. One part dissolves in three parts of cold water; in 1½ parts hot water. (Rapid fixing baths.)

Ammonium persulphate, $(NH_4)_2S_2O_8$. Small white crystals, dissolving in 1½ times their weight of cold water. Decomposed by hot water. Persulphate greedily absorbs moisture from the air and must be kept in a well stoppered bottle. (Reducing.)

Ammonium sulphide (polysulphide).—Sold as deep yellow liquid smelling strongly of rotten eggs. Contains traces of other sulphur compounds with the ammonium sulphide $(NH_4)_2S$. (Toning).

Ammonium sulphocyanide, *i.e.*, ammonium thiocyanate, sometimes called ammonium sulphocyanate, NH_4CNS. Small white crystals which absorb moisture with great avidity, becoming wet if not well stoppered. Sulphocyanide, which has deteriorated in this manner should be thrown away; it cannot be dried by heat. The crystals are exceedingly soluble in water and in alcohol. (Toning P.O.P.; developers for reversal process.)

Borax, *i.e.*, borate of soda, $Na_2B_4O_7 \cdot 10H_2O$. Pure white crystalline powder, one part of which dissolves in 12½ parts of cold water—but very much more readily in hot water. Solutions of borax in water are weakly alkaline. (Fine grain developers.)

Boric Acid, H_3BO_3, pure white crystalline powder, four parts dissolve in 100 of water at ordinary temperatures, used in conjunction with borax, in the preparation of a fine-grain developer, known as "Buffered Borax."

Calcium chloride, $CaCl_2$.—The commercial fused form of this substance is the most active absorbent of moisture, for which purpose, in admixture with asbestos, it is used for preserving platinotype paper in a dry condition. An ample supply of the dried chloride can be used with advantage in containers (preferably metal boxes) of sensitive papers or plates. The lumps of chloride may be put in a holder of perforated zinc, of size sufficient for several pounds. When it becomes visibly damp, the chloride can be restored to its original condition by heating it in an iron shovel over the fire.

Caustic potash, i.e., potassium hydroxide, K O H. The "strongest" form of alkali, having a powerful corrosive action on the skin. The pure photographic quality is sold in sticks or pellets which quickly become moist to the touch by absorbing water from the air and also in time become encrusted with a powdery deposit due to the formation of carbonate by absorption of carbon dioxide. Caustic potash must be kept in a well corked bottle, not glass stoppered, since the potash acts on the glass and causes the stopper to stick. For the same reason solution of caustic potash should be rubber-stoppered. A purer form of

caustic potash is that known as "pure by alcohol"; the potash is in pieces of fibrous structure. Caustic potash dissolves readily in half its weight of cold water with production of much heat. A solution quickly cleans greasy bottles; it softens gelatine a weak hot bath being used for the wholesale removal of the films from waste negatives, and is used in the preparation of high-energy developers.

Caustic soda, *i.e.*, sodium hydroxide, NaOH. Except that it is a somewhat less "powerful" alkali and is not so readily soluble in water, caustic soda is similar to caustic potash. It is supplied in stick form and, in two qualities, "pure" and "pure by alcohol," and calls for the same precautions in keeping it both in the solid state and in solution. (Contrast developers.)

Chrome alum, double sulphate of chromium and potassium, $Cr_2 K_2 (SO_4)$. $24H_2O$. Violet crystals which are ruby red by transmitted light. Dissolves in about six times its weight of cold water. Hot water should not be used for dissolving it. Chrome alum toughens gelatine somewhat more energetically than do the ordinary white alums, and its tanning action is further increased by addition of a few drops of ammonia, sufficient to render the solution slightly alkaline. (Hardening baths.)

Chlorquinol (mono-chlor-hydroquinone), Cl. C_6H_3. $(OH)_2$. A white or slightly tinted crystalline powder, which dissolves readily in water and is also soluble in alcohol and other organic solvents. Much more energetic developer than hydroquinone, which it resembles chemically.

Citric acid, $C_3H_4(OH)(COOH)_3$ small colourless crystals extremely soluble in water; slightly soluble in alcohol. (Acid fixing baths.)

Copper sulphate, blue vitriol, $CuSO_4 \cdot 5H_2O$. Blue crystals which dissolve in $2\frac{1}{2}$ times their weight of cold water; half their weight of hot water; insoluble in alcohol. For its chief photographic use, namely copper toning, the pure sulphate should be used; commercial sulphate often contains iron. Should be kept well corked to prevent formation of a bluish-green incrustation.

Dextrine, fine powder, which for use as a mountant, should be the pure white quality; the yellow is less suitable. Simply dissolved in a little water, dextrine forms a highly adhesive syrup but is best prepared by heating it with about $1\frac{1}{2}$ times its weight of water to 160 deg. F. and setting it aside in a cool place for the mixture to congeal to a firm smooth paste.

Ferric ammonium citrate, double citrate of iron and ammonia. It is obtainable in two forms—(1) brown scales, from any chemist, and (2) fine green scales from photographic dealers. The green citrate is much more sensitive to light than the brown and is now almost always used in the preparation of sensitive iron-printing papers.

Ferrous oxalate, the active substance $Fe(COO)_2 2H_2O$ of the ferrous oxalate developer. It is itself almost insoluble in water, but is freely soluble in solution of potassium oxalate. It is thus

formed in solution by mixing solutions of ferrous sulphate and potassium oxalate.

Ferrous sulphate, proto-sulphate of iron, green vitriol, $FeSO_4 \cdot 7H_2O$. Should be in clear emerald green crystals, free from reddish markings. Slowly oxidises in the air and must be kept well stoppered. One part dissolves in about 1½ parts of cold water, forming a green solution which also gradually oxidises, becoming more yellowish in tint and slightly turbid. This change can be prevented by making the solution acid with a little sulphuric or tartaric acid, and by keeping a few pieces of iron wire in the mixture. Also the solutions keep better in bright light. (Used in preparation of ferrous oxalate developer.)

Formalin, 40 per cent. solution of formaldehyde, H.CHO. The solution has a characteristic penetrating odour, causing the eyes to water. It mixes with water in all proportions and is slightly acid. (Hardener; preservative.)

Gelatine is not a definite chemical compound, but a mixture of colloid substances. It swells in cold water, dissolves when the swollen mass is heated and sets to a jelly on cooling. A solution of gelatine may be sufficiently weak to be fluid when cold; on addition of alcohol the gelatine is thrown out of solution. Gelatine is dissolved in the cold by oxalic, hydrochloric, acetic and nitric acids. The mixture with the last named forms a liquid glue; that with acetic acid is used as a cement for celluloid. Barium chloride and chloral hydrate also dissolve gelatine in the cold. Alum, formalin and tannic acid harden gelatine, *i.e.*, render it insoluble in, and unswollen by, water.

Glycerine, colourless syrupy liquid, $C_3H_5(OH)_3$, of sp. gr. 1·265. It mixes with water or alcohol in all proportions. Glycerine is entirely non-volatile at the ordinary temperature, that is, it does not "dry up" but absorbs moisture from the air. A solution of it in water is therefore used as a bath for rendering supple the gelatine coating on papers or film after excessive drying; the water of the bath evaporates, leaving a small quantity of glycerine in the emulsion coating.

Glycin, para-hydroxy-phenylamino-acetic acid. $OH \cdot C_6H_4 \cdot (NH \cdot CH_2COOH)$. It is a white powder of minute thin plates, very slightly soluble in water but readily soluble in alkaline solutions. Almost insoluble in alcohol. (Developer.)

Gold Chloride.—The yellow crystals commonly sold in Great Britain are a compound of gold chloride and sodium chloride of the formula $NaAuCl_4 \cdot 2H_2O$. Each 15 grs. thus contains 7½ grs. of gold metal. Another commercial form of gold chloride is the brown crystals of formula $HAuCl_4 \cdot 3H_2O$, likewise containing half their weight of gold metal. (Toning.)

Hydrochloric acid, *i.e.*, muriatic acid, a solution in water of the gas HCl. The pure commercial acid has sp. gr. of 1·16 and is a strongly fuming corrosive liquid, which acts chemically and dissolves the oxides and carbonates of most of the metals. "Spirits of salt" is a crude form of hydrochloric acid, containing iron, etc., and is

a powerful cleanser of glass vessels containing mineral deposits.

Hydrofluoric acid, strongly fuming and highly corrosive solution of hydrofluoric acid gas, HF. Commercially the acid is sold of a strength of 60 per cent. It must be kept in gutta-percha bottles, as it attacks glass and thus is used for detaching the gelatine film from glass negative, and for etching glass. All contact of even a weak solution of the acid with the fingers must be avoided.

Hydroquinone, *i.e.*, quinol, hydrokinone, hydrochinon, *p*-dihydroxy-benzene, $C_6H_4(OH)_2$. Fine white needle crystals, dissolving in about 18 parts of water, in two parts of 90 per cent. alcohol. (Developer).

Hypo, sodium thiosulphate, $Na_2S_2O_3 \cdot 5H_2O$. Sometimes loosely termed hyposulphite of soda. Obtainable as small pea crystals or as much larger crystals of hexagon shape. Extremely soluble in water, which dissolves nearly twice its weight of hypo. The solution becomes thereby chilled, so that it is better to use warm or hot water in dissolving hypo. Strong acids and acid salts decompose hypo, giving rise to sulphurous acid (odour of burning sulphur) and to a yellowish deposit of sulphur in the solution. Sulphurous acid and its acid salts have not this effect on hypo. In photography hypo is used as a chemical solvent of the silver bromide or silver chloride in the emulsions of plates or papers. It is a much less active solvent of silver iodide. Hypo is also obtainable in the dry or anhydrous form *i.e.*, without the 5 molecules of water of crystallisation. The dry variety is a white powder, which dissolves in water much more rapidly than the crystals. In fixing, 3 parts of the dry are equivalent to about 5 parts ofthe cryst.

Iodine, greyish violet flakes of plates of metallic lustre. It is insoluble in water but dissolves readily in alcohol. It is also readily soluble in a solution of potassium iodide. By mixing the iodine flakes with about three times their weight of iodide crystals and adding just enough water to cover the latter, the iodine dissolves at once, remaining in solution when adding further water. With starch iodine forms an intensely blue compound. Iodine stains on fingers, etc., disappear in hypo or sulphite. (Local reducer.)

Lead acetate, sugar of lead, $Pb(CH_3COO)_2 \ 3H_2O$. Clear white crystals dissolving in $1\frac{1}{2}$ times their weight of cold water; hot water should not be used. When using tap water, the solution will be slightly milky from formation of lead chloride, sulphate or carbonate. (Toning.)

Liver of sulphur, Potassa sulphurata, or potassium sulphide, containing small proportions of sulphate and carbonate of soda, hypo and polysulphide compounds. Sold in pieces of reddish-brown colour, very soluble in water. (Silver recovery from fixing baths; toning.)

Mercuric iodide, bi-iodide of mercury, HgI_2. Bright red powder insoluble in water, but dissolving readily in solution of potassium iodide, hypo or soda sulphite. The solution in sulphite forms the Lumière mercury intensifier. Intensely poisonous.

Mercuric chloride, bichloride

or perchloride of mercury. $HgCl_2$. Heavy fibrous pieces or crystalline powder. One part requires 16 parts of cold water, but less than 2 parts of boiling water for solution. Much more soluble in cold water if hydrochloric acid or ammonium chloride is added. The solutions are intensely poisonous and should on no account be allowed to come in contact with broken skin. (Intensifier.)

Metol, mono-methyl-paraminophenol sulphate, $OH \cdot C_6H_4 (NH \cdot CH_3)$, $\frac{1}{2}H_2SO_4$. White crystalline powder. Metol dissolves with some difficulty in sulphite solution. Hence, in making up developers, the metol should be dissolved with only a small proportion of sulphite.

Nitric Acid.—Strongly corrosive and fuming liquid. The commercial strong pure acid of 1·42 sp. gr. contains 71 per cent. of real acid, HNO_3. Burns the skin and clothes.

Oxalic acid, white crystals, $(COOH)_2$. Solubility in water 1 in 10 cold, 1 in 3 hot. Solutions made with ordinary tap water are milky from formation of oxalate of lime. On standing, the latter settles as a white deposit from which the almost clear solution can be poured off.

Paraminophenol (base).—Yellowish-white crystalline powder, $OH \cdot C_6H_4 \cdot NH_2$. Very slightly soluble in cold water; dissolves more freely in hot water. The hydrochloride of paraminophenol, which is the compound used in photography, is a crystalline powder readily soluble in 4 or 5 times its weight of water. Its keeping properties are much better than those of the free base, and is used for making concentrated single-solution developers in conjunction with a caustic alkali.

Para-phenylene-diamine (base).—Yellowish-white to dark brown crystals, slightly soluble in cold water. $C_6H_4(NH_2)_2$. Usually sold as the hydrochloride, which is much more soluble. Extensively used as a fine grain developer alone or together with glycin and/or metol, either with or without some very weak alkali, such as tribasic sodium phosphate.

Potassium bichromate, bichromate of potash, potassium dichromate, red chromate of potash. $K_2 Cr_2 O_7$. Large orange-red crystals dissolving in about 14 parts of cold water; soluble in their own weight of hot water. By addition of ammonia the reddish orange colour of bichromate solution is changed to yellow, due to formation of mono or neutral chromate. Mixed with an acid, bichromate is a powerful oxidising agent. A saturated solution, mixed with about 1-20th of its volume of strong sulphuric acid, is a powerful cleanser of almost all kinds of dirt from bottles. It can be used repeatedly until exhausted. (Bleacher in reversal process; intensifying.)

Potassium bromide, bromide of potash, KBr. Small colourless crystals, dissolving in 1½ times their weight of cold water. (Restrainer; re-halogeniser.)

Potassium carbonate, carbonate of potash, K_2CO_3. Granular white powder which rapidly becomes moist by absorbing water from the air and must be kept closely stoppered. Dissolves in less than its own weight of cold water. The above refers to

potassium carbonate sold as "dry" or anhydrous. This is the variety to be used in photographic formulæ. The so-called "cryst" potass-carbonate is of uncertain composition. (Developers; rapid drying of negatives in emergency.)

Potassium chloro-platinite, proto-chloride of platinum and potassium, K_2PtCl_4. Small red crystals, dissolving in about 6 times their weight of cold water; insoluble in alcohol. The salt should contain nearly half its weight (46 per cent.) of platinum metal. Solutions should be made in distilled water and, with addition of a drop of hydrochloric acid, kept in well stoppered glass bottles. (Platinum toning.)

Potassium cyanide, cyanide of potash, KCN. Sold as white hard pieces (fused), of qualities equivalent to 30 per cent. It is very soluble in water or alcohol. Cyanide is intensely poisonous, the solution should not be allowed to come into contact with broken skin. A further danger is the production of prussic acid vapour on addition of an acid to cyanide solution. Cyanide is a powerful solvent of silver bromide and silver chloride and also of silver iodide, but its perceptible solvent action on the developed silver image makes it a less desirable fixing agent than hypo. (Local reducer.)

Potassium ferricyanide, red prussiate of potash, $K_3Fe(CN)_6$. Deep ruby red crystals, usually covered with a slight reddish coating. It is best to rinse the crystals in water before dissolving them; they are then seen to be clear ruby red. Ferricyanide dissolves in 2½ times its weight of cold water, forming a yellowish brown solution if strong; greenish yellow, if weak. The solution does not keep very well; it should be kept in the dark. The keeping quality is improved by dissolving some common salt along with the ferricyanide.

Potassium ferrocyanide, ferrocyanide of potash, yellow prussiate of potash, $K_4Fe(CN)_6$ $3H_2O$. Large lemon-yellow crystals, dissolving in 3½ times their weight of water. Insoluble in alcohol. By addition of an acid, solutions of ferrocyanide slowly give off slight fumes of the intensely poisonous prussic acid gas.

Potassium iodide, iodide of potash. KI. Small white crystals, dissolving in less than their own weight of water. Slightly soluble in alcohol. Changes in the light, becoming slightly yellow. This is immaterial for its chief use in photographic work, viz., dissolving iodine and in intensifiers.

Potassium metabisulphite, $K_2S_2O_5$. White crystals which should be transparent, but usually have a slight incrustation, rendering them opaque. Deteriorates rapidly in air, should be kept sealed. Dissolves fairly readily in cold water forming an acid solution smelling of sulphurous acid. Is partially decomposed by hot water, which should not be used for dissolving it. (Acidifying fixing baths; preserving developers.)

Potassium oxalate, neutral oxalate of potash, $(COOK)_2 \cdot H_2O$. Colourless crystals dissolving in three times their weight of cold water; much more soluble in hot water. When dissolved in tap water, containing lime, there

is a considerable deposit of calcium oxalate. This settles in a few hours, when the almost clear solution can be poured off.

Potassium permanganate, permanganate of potash, $KMnO_4$. Small black crystals of metallic lustre. About 16 parts of cold water are required to dissolve 1 part of the crystals, but a strong solution is much more quickly made in hot water. The solution stains fingers, etc., a deep brown, the stain can be removed with a solution of metabisulphite or of oxalic acid, or by rubbing with crystals of these substances. A solution of permanganate, especially if made acid with sulphuric acid, instantly removes developer and other stains from dishes.

Pyrogallic acid, pyrogallol, tri-hydroxy-benzene, $C_6H_3(OH)_3$. Obtainable in two forms—(1) sublimed, fine feathery crystals, an ounce by weight of which occupies about 10 ozs. bulk, (2) crystallised, much denser of about 1-10th the bulk. The properties of the two forms are the same. Extremely soluble in water and alcohol. The solution in water oxidises very rapidly and cannot be kept except with the aid of preservatives, such as sulphites, citric acid, etc. When making up developers, the pyro should be added *after* these preservatives have been mixed with the water.

Silver nitrate, nitrate of silver, $AgNO_3$. Transparent or semi-transparent colourless flat crystals, dissolving in less than half their weight of water. To make a clear solution, distilled water must be used; the chlorides in most tap waters cause a milkiness. Solutions should be kept in glass-stoppered bottles in the dark. Silver nitrate causes intense brown or black stains on fingers or clothes; these can be removed by rubbing with tincture of iodine followed by strong solution of hypo.

Sodium acetate.—Colourless transparent crystals, $CH_3.COONa\ 3H_2O$, dissolving in less than three times their weight of cold water. Much more soluble in hot water.

Sodium bicarbonate, bicarbonate of soda, $NaHCO_3$. By grocers bicarbonate is sold as "carbonate of soda." Fine white powder requiring about 11 times its weight of cold water for solution. In hot water it is partially decomposed, forming ordinary sodium carbonate. Bicarbonate is very feebly alkaline, but neutralises acids. For this reason it is used in hypo baths for fixing self-toning papers; the bicarbonate neutralises the acid from the papers, without, however, making the fixing bath strongly alkaline.

Sodium bisulphite, $NaHSO_3$ is obtainable in the solid state, but more readily as a solution called soda bisulphite lye of average density, 36 deg. Baumé (=1·33 sp. gr.). This is a colourless or pale yellow liquor which can be used instead of sodium sulphite. But unlike sulphite it is acid, neutralising a certain proportion of the alkali of a developer.

Sodium carbonate, *i.e.*, carbonate of soda, sold in two forms, crystal, $Na_2CO_3\ 10H_2O$, and dry or anhydrous, Na_2CO_3. Washing soda is a somewhat impure form of cryst. sodium carbonate, which, for photographic use, should be in small clear crystals dissolving in water to a perfectly clear solution. The

"dry" carbonate is a coarse powder which actively absorbs water, and must be kept well stoppered. One part of the dry carbonate is equivalent to slightly more than 2½ parts of the cryst, e.g., in making up a developer ·37 oz. (=160 grs.) of the dry is to be used in place of 1 oz. of the cryst. and *vice versa.* The dry carbonate dissolves in about 6 times its weight of cold water; the cryst. in 1½ times.

Sodium sulphide.—The pure substance is in small colourless crystals, $Na_2S.9H_2O$, which rapidly become moist by exposure to the air. Exceedingly soluble in water. Sodium sulphide keeps well in strong solution, e.g., of 20 per cent. strength, but rapidly oxidises in a weak solution. This is why the working bath in sepia toning should be made up at the time of use by mixing a little strong sulphide solution with the required quantity of water. The yellowish commercial quality is sometimes used for precipitating silver residues in solution.

Sodium sulphite, *i.e.*, sulphite of soda, $Na_2SO_3·7H_2O$. This cryst. sulphite should be in clear crystals, which should be kept well corked, otherwise they become dull and powdery from partial oxidation. Sulphite which has become slightly encrusted may be rinsed for a few seconds in a measure with enough cold water to cover it, the water poured away, and the crystals dried on a clean cloth for weighing out. Cryst. sulphite is most soluble in water at about 100 deg. F., about as hot as the hand can comfortably bear. Dry or anhydrous sulphite. Na_2SO_3, is a white powder which dissolves in water more readily than the cryst. One part of it is equivalent to 2 parts of the crystal. (Preservative for developers; on account of its solvent action on silver halide used in high concentration in some fine grain developers.)

Starch.—Fine white powder, which is insoluble in cold water, but in boiling water forms a kind of solution which, if strong, is a fairly stiff jelly or paste (starch mountant). Pure starch powder should be used for making mountant, not the granular laundry starch.

Sulphuric acid.— Syrupy, highly corrosive heavy liquid of 1·84 sp. gr. containing 98 per cent. of the real acid, H_2SO_4. This strong acid absorbs water rapidly from the air. When mixed with water, great heat is developed. The acid should always be added slowly to the water. If water is added to the acid, the great heat may crack the vessel, and throw out part of the contents with almost explosive violence. (Reversing baths.)

Sulphurous acid, solution in water of the gas SO_2. The saturated solution is equivalent to 9·5 per cent. sulphurous acid, H_2SO_3, but it rapidly loses strength by escape of SO_2 and by oxidation.

Thiocarbamide, thio - urea, sulpho-carbamide, $CS(NH_2)_2$. Small colourless crystals requiring about 11 parts of their weight of cold water for solution, very soluble in hot water and in alcohol. In solution with an acid, thiocarbamide removes developer stain. (Lantern slide developer; clearing baths.)

MISCELLANEOUS INFORMATION.

Copyright in Photographs.

1. Copyright (the right to copy in any form) subsists in photographs because such right is recognised as a species of property by the law of England (and of most other countries).

In Great Britain, the law is embodied in the Copyright Act of 1911 (H.M. Stationery Office, Kingsway, London, 3d.) which came into force July 1, 1912.

2. The Copyright Act has been adopted (in some cases with alteration) by the Dominions of Canada and New Zealand, Union of South Africa and Commonwealth of Australia. Copies of the Acts may be obtained from the offices of the respective governments in Ottawa, Dunedin, Pretoria and Canberra. The effect of these Acts is that copyright created in Great Britain extends to those parts of the British Empire.

3. Copyright is created by the mere act of taking the photograph. There is nothing else that should or can be done. It is not necessary to mark photographs "Copyright" in order to create or maintain the copyright in them. There must be copyright in every photograph that is taken, and the copyright must belong to some person.

4. Copyright is the "sole right to produce or reproduce the photograph or any substantial part thereof in any material form whatsoever."

5. Copyright in photographs lasts for 50 years from the making of the original negative.

6. Anything which is not itself copyright may be photographed, and the photograph will be copyright. This applies to people's faces (taken with or without their permission), any scene or landscape, works by the Old Masters of paintings—anything which is *not* a painting, drawing, or other work in which there is copyright. But note:

(*a*) You may take a photograph from an unusual point of view and of course obtain copyright in your picture. But anyone else may afterwards photograph the scene from the same standpoint, and he obtains copyright in *his* picture.

(*b*) A photographic copy of an Old Master is itself copyright, if it is made by photographing the original, but a photograph of another photograph of the original would (most probably) be an infringement of the copyright in the latter and, therefore, would not be entitled to copyright.

7. Although there is copyright in "architectural works of art" (buildings), the taking of photographs of such buildings is specially permitted by the Act. The same applies to works of sculpture if "permanently situate in a public place."

8. Copyright in a photograph includes copying in another style, *e.g.*, as a drawing in line or wash or in colours, or as an etching, or larger or smaller.

Moreover, the copy need not be exact to be unlawful. It may be different, but if it is a "colourable imitation," *i.e.*, recognisable as having been made from the photograph, it is unlawful.

9. The copying of part of a photograph, *e.g.*, a face in a group, is also unlawful.

10. Anyone who takes a photograph at his own expense, not to the order of anyone, nor as an employee of somebody, automatically becomes the owner of the copyright.

11. But if the photograph is ordered and is made "for valuable consideration" in pursuance of the order, the copyright automatically becomes the property of the person giving the order; or of the employer, if made by an employee in course of his employment.

12. The copyright continues to be the property of the customer, even though he fails to pay. The photographer is not entitled to take the copyright because the customer has not paid. The two things are distinct.

13. Although not the subject of copyright law, the negatives which a photographer makes in executing an order, by common law and long trade custom, are his property, unless in the first instance he contracted to surrender them. But they cannot be used for any purpose except as the customer directs or permits.

14. The copyright in a photograph may be sold outright or piecemeal (*i.e.*, for various limited purposes), but any such transfer is not valid unless in writing.

For example, a photographer may tell a sitter who has come in the usual way that he will charge less if he obtains the copyright. Both parties may agree to this arrangement, but unless a sitter signs a form of words to this effect, he or she is (and continues to be) the owner of the copyright.

15. Any copying or reproduction of a photograph without the permission of the owner of the copyright is an infringement of the latter. It is also an infringement for anyone to sell or show for sale copies that they know to be infringements.

16. When a photograph has been published without permission, the infringer should be asked what compensation he will make—not asked for a particular sum. It is usual to accept twice the fee which would have been charged in the first instance. Anyone concerned in reproducing photographs may be expected to know that there must be copyright in every photograph of recent date. His only defence is that he had permission from someone he thought to be the owner of the copyright.

17. In any action for infringement, the plaintiff is assumed to be the owner of the copyright; it is left to the defendant to show that he is not.

18. Copyright created in Great Britain or in British Dominions also extends to all the countries subscribing to the International Copyright Convention, *viz.*, to the chief countries of the world, with exception of the United States of America and Soviet Russia. According to the Convention, a resident national of any country observes the formalities in his country (none in Great Britain), and obtains in all the other

countries the degree of protection granted to their nationals. As a consequence of this Convention, the rights in photographs by people of almost every nationality must be respected in almost every country.

19. As regards the United States, there are various special reciprocal agreements between the U.S. and a number of countries, according to which those who are not American citizens can obtain copyright in the United States by observing the formalities in force there, *viz.*, registration of the photographs in Washington and marking of prints to show that they are copyright. (Particulars from the U.S. Registrar of Copyrights, Washington). Reciprocally, American citizens obtain copyright in Great Britain and in the other countries which have entered into this arrangement.

Reproduction Fees.

According to an agreement concluded in June 1929 between associations representing London and provincial newspapers and the Proprietors Association of Press Photographic Agencies the minimum fees payable for the reproduction of photographs are as follows :—

LONDON.

Stamp-heads. Up to 2½ sq. ins. ...	12s. 6d.
Portraits up to 15 sq. ins.	15s. 0d.
Any picture up to 30 sq. ins.	17s. 6d.
Any picture over 30 up to 50 sq. ins. ...	27s. 6d.
Any picture over 50 up to 80 sq. ins. ...	42s. 0d.
Any picture over 80 sq. ins.	90s. 0d.

PROVINCES.

The fees for first publication of photographs in Provincial or Scottish morning, evening or Sunday newspapers shall be :—

Stamp-heads. Up to 2½ sq. ins. ...	7s. 6d.
Any picture other than a stamp-head up to 50 sq. ins....	10s. 6d.
Any picture over 50 up to 80 sq. ins....	15s. 0d.
Any picture over 80 sq. ins.	17s. 6d.

Reprints (for photographs reproduced on or after January 1st, 1929) :—

LONDON.

Stamp-heads ...	7s. 0d.
Pictures of any larger size	8s. 6d.

PROVINCES.

Stamp-heads ...	5s. 0d.
Up to 25 sq. ins. ...	6s. 0d.
Over...	7s. 6d.

The newspapers have offered similar terms to photographers in general except that *all* photographs supplied previous to and after October 1st, 1929, are subject to above reprint rate.

Weekly newspapers such as the *Sphere* pay a minimum fee of 10s. 6d. not exceeding 3 sq. ins.
14s. 0d. between 3 and 12 sq. ins.
17s. 6d. ,, 12 and 30 ,, ,,
30s. 0d. ,, 30 and 60 ,, ,,
60s. 0d. ,, 60 and 90 ,, ,,
100s. 0d. over 90 sq. ins.

Other weekly publications (not trade papers) pay :—
10s. 6d. not exceeding 3 sq. ins.
14s. 0d. between 3 and 30 ,, ,,
25s. 0d. ,, 30 and 60 ,, ,,
50s. 0d. ,, 60 and 90 ,, ,,
90s. 0d. over 90 sq. ins.

Trade papers pay :—
10s. 6d. not exceeding 30 sq. ins.

21s. 0d. between 30 and 60 sq. ins.
42s. 0d. ,, 60 and 90 ,, ,,
84s. 0d. over 90 sq. ins.

Minimum rates for photographs for advertisements, use on calendars, picture postcards, etc.

ADVERTISEMENTS IN NEWSPAPERS AND PERIODICALS.

Where a single photograph is supplied to be used in not more than three insertions of an advertisement, a minimum fee of £1 1s. is to be charged per insertion.

Where more than one photograph is supplied by the same firm for use in not more than three insertions of the same advertisement, a minimum fee of 10s. 6d. is to be charged for each insertion of each photograph after the first photograph, the first photograph being charged at a minimum fee of £1 1s. per insertion.

Where a single photograph is supplied to be used in more than three insertions of an advertisement, a minimum fee of £3 3s. to be charged.

Where more than one photograph is supplied by the same firm for use in more than three insertions of the same advertisement, a minimum fee of £1 11s. 6d. is to be charged for each photograph, the first being charged at £3 3s. 0d.

USE ON CALENDARS, PICTURE POSTCARDS, CHRISTMAS AND GREETING CARDS AND VALENTINES.

Calendars.—A minimum fee of £2 2s. per photograph, with exclusive calendar use for one year. If supplied without exclusivity, a minimum fee of 10s. 6d. to be charged for each photograph.

Picture Postcards.—A minimum fee of 10s. 6d. per photograph.

Christmas and Greeting Cards and Valentines.—A minimum fee of 10s. 6d. per photograph.

Cigarette Stiffeners.—A minimum fee of 10s. 6d. per photograph, up to a minimum of 25 subjects.

Advertising Posters.—Up to single crown size, a minimum fee of £2 2s.; double crown, minimum fee of £3 3s.; 16-sheet poster, minimum fee of £10 10s.; 48-sheet poster, minimum fee of £21 0s.

Factory Acts.

Premises in Great Britain where persons are *employed* in photographic work come within the regulations of the Factory and Workshop Act, 1901 (H.M. Stationery Office, 2s.). The Act does *not* apply to premises where assistants are *not* employed (one-man businesses).

Premises are classified as "factories" (places where mechanical power, including electric, is used) and "workshops" (places where power is *not* used.) The Act applies to both. Thus dark-rooms, printing-rooms are "workshops" but if fitted with power-driven apparatus (*e.g.*, drying machines, washers) are "factories."

The Act regulates hours and conditions of employment (as regards hygiene and safety) and requires particulars to be kept in a prescribed Register, as to the "young persons" employed and dates of periodical painting or lime-washing. Any accidents must be reported to the Inspector for the district.

H.M. Factory Inspectors are to a large extent technical experts

and it is always well to welcome their inspection and to invite their approval beforehand of new premises or changes in existing workshops.

Although not stated in the Act, the studio of a portrait photographer is *not* regarded administratively as coming under the Act, but studios of commercial photographers and photo-engravers are subject to the Act.

The following are the principal requirements which apply to photographic premises.

Notices.—There shall be displayed on the premises, so as to be read by employees, an abstract of the Factory and Workshop Act, name and address of district Inspector and particulars of the day and time of the weekly half-holiday. A General Register must also be kept of the particulars of "young persons"—boys and girls—over 14 and under 18 years of age, employed. Particulars of the painting or lime-washing of workrooms must also be entered in the Register, and also details of any accident occurring to persons employed. The Register must be kept available and produced when demanded by the Inspector.

Hours of Employment.—There is no restriction as to the employment of men—including boys over 18 years of age. Permissible hours of employment for women and young persons for full days are 6 a.m. to 6 p.m., 7 a.m. to 7 p.m., or 8 a.m. to 8 p.m., with 1½ hours interval for meals, of which at least 1 hour shall be before 3 p.m. On Saturdays (or other day appointed as half-holiday,) 6 a.m. to 2 p.m., 7 a.m. to 3 p.m., or 8 a.m. to 4 p.m. with half an hour interval for meals. Times of employment and meals must be stated on the abstract affixed in the works.

Overtime.—In certain trades, classed as "seasonal," the period of employment of women on full days may be 2 hours longer than stated above on not more than 30 days in the year, with 2 hours interval for meals. At present photography is *not* classed as a seasonal trade under the Act.

Sundays.—A woman, young person, or child shall not be employed on Sunday, but there is no restriction for men.

Young persons (see above) must be certified (by the certifying surgeon appointed under the Act) as fit for employment. This is done by the Surgeon signing the General Register. The name and address of the Certifying Surgeon are shown on the Abstract of the Act, or may be obtained from the Factory Inspector. A nominal fee is chargeable by the Surgeon.

Accidents must be reported to the Inspector if such as to incapacitate an employee from following his ordinary occupation for 5 hours on any one of the three working days next after the occurrence of the accident.

Hygiene and Safety.—The Act requires sufficient cubic space, *e.g.*, 250 cub. ft., per employee, reasonable temperature and ventilation and precautions against fire in premises : also the fencing of any moving part of a machine considered dangerous to employees. Precautions against fire apply particularly to the handling of celluloid films and plates, where smoking, use of naked lights, etc., should be prohibited. The possibility of

fire is greatest in the handling of roll-film. Fires from stocks of the thicker cut or portrait film negatives when stored with observance of due precautions (see below) are of rare occurrence.

Special Regulations. — In places where celluloid in the form of roll-film or cut film is used the Celluloid Regulations are operative (see below). These include fire-resisting storage, prohibition of naked lights and other sources of ignition unless adequately protected, no smoking in work-rooms and particularly easy means of exit, all workroom doors opening outwards or sliding. The Inspector should be consulted and his advice asked for on these matters. The Cinematograph Film Regulations do not apply to still photographic work nor to the manipulation of non-flam film.

Storage of Celluloid.

In Great Britain the storage of celluloid in the form of sensitive film or celluloid negatives is subject to the regulations set forth in "Statutory Rules and Orders, 1921, No. 1825" (H.M. Stationery Office, London, Edinburgh, Manchester, Cardiff and Belfast, price 1d.) under Section 79 of the Factory and Workshop Act.

A memorandum prepared specially for the information of professional photographers on the storage of celluloid on premises to which the Factory and Workshop Acts apply is obtainable from the Home Office, Whitehall, London, S.W. 1.

As regards sensitive films kept on premises in quantity which as a rule does not exceed 14 lbs. storage in a drawer or cupboard in a private office or other room in which no handling of celluloid is done is officially regarded as complying with the requirement for "safe storage."

The regulations in respect to developed negatives will depend to some extent on the amount of such negatives. Where the latter are of considerable weight, they require to be kept in a fire-resisting store, such as a cabinet or cupboard constructed of fireproof material, *e.g.*, sheet metal, asbestos sheeting, or wood effectively treated to resist flame. This store requires to be of sound construction and is to be kept locked. The door or lid needs to be so arranged that there is no naked light or open fire near at hand. The store should not be situated in a work-room where celluloid is handled nor on a stair, nor near a door, nor in a passage through which persons might have to pass to escape in the event of a fire. The nature of the contents should be clearly marked on the outside of the store, and a cautionary notice put up prohibiting the use of naked lights. An adequate supply of buckets of water should be kept always available close outside the store, water being the best extinguisher of celluloid.

The foregoing recommendations are for general guidance and are subject to modification, according to the quantity of celluloid, or on account of the design of the building or nature of the processes, at the discretion of the District Inspector of Factories.

Premises may be exempted from the above regulations on the authority of the Chief Inspector of Factories, Home Office, Whitehall, London, S.W. 1.

The Shop Acts.

(*Great Britain.*)

Under the Shop Acts of 1911 and 1912, the parts of a photographer's premises in which goods are sold to the public is a "shop." As such, it must be closed one half-day in each week from 1 p.m. unless exempted on certain grounds.

It has, however, been held that a photographer may admit sitters to his establishment on the weekly half-holiday by previous appointment, but must not keep the "shop" open for chance passers-by.

Assistants in a "shop," that is to say receptionists and others who take orders from customers, or despatch goods, are entitled under the Act each week to one half-day holiday beginning not later than 1.30. The half-holiday may be on the half-day closing day or on another day of the week. The employer is required to put up a notice in his shop stating the days when his assistants are to have their half-holiday.

In holiday resorts in which an Order allowing shops to keep open during the holiday season on the weekly half-holiday is in force, an employer who satisfies the local authority that he gives his assistants a holiday on full pay of not less than two weeks during the year and posts a notice to that effect in his shop, need not give his assistants a half-holiday during the time the Order is in operation.

The Shop Acts are administered by local authorities: applications for information on particular points should be made in the photographer's district.

Registration of Business Names.

(*Great Britain.*)

Under the Registration of Business Names Act, 1916, it is required that persons who carry on a business in Great Britain under a name which is not their true name or the name by which they have always been known shall register the business with the Registrar of Business Names.

It is required that a person or partnership shall register if the "business name" includes any addition to the name of the person or names of partners. Thus Joseph Jones if he trades as "Jones & Co." must register.

Also every individual or firm who, or a member of which, has either before or after the passing of the Act changed his name must register. This does not apply to women who change their name by marriage.

The cost of registration is 5s. Offices of the Registrars are: England and Wales, Princes House, 37 Kingsway, W.C. 2; Scotland, Exchequer Chambers, Parliament Square, Edinburgh; Northern Ireland, 15 Donegal Square West, Belfast; Irish Free State, Coleraine House, Dublin.

Registered firms must state in all catalogues, circulars, show cards and business letters, on which the name appears, the christian name, or initial and surname of the proprietor; and of all partners, in businesses belonging to more than one person.

If the individual 'proprietor' or partners are not British

the nationality must also be stated on business stationery; and if there has been a change of nationality, the original nationality.

Fines not exceeding £5 may be inflicted for failure to register, or non-observance of these provisions.

Photographers who come within the Act are not required to publish their true name on photographs, postcards, etc.

Passport Photographs.

The space provided for photographs on British passports measures 2 × 2¾ inches. Photographs require to be unmounted and on thin paper.

Exhibitions.

The chief exhibitions held in England are :—

Royal Photographic Society. Pictorial and technical. September-October. Secretary: H. H. Blacklock, 35, Russell Square, London, W.C.

London Salon. Pictorial only. September-October. The Secretary, 5A, Pall Mall East, London.

Northern. Pictorial and technical. Organized by Bradford P.S. or Manchester A.P.S.

Scottish Salon. Pictorial only. January. Organized by Scottish Photographic Federation.

Midland. Chiefly pictorial. September. Organized by Midland Counties Federation.

The Professional Photographers' Association. Portraiture and commercial. September. The Secretary, 49 Gordon Square, London, W.C. 1.

In France.

Paris Salon. Pictorial only. October. Société Française de Photographie.

Text-Books.

Those of the books in the following list which are still in print are obtainable by order from all photographic dealers. But a very large number are now out of print, though obtainable, in many cases, from dealers in second-hand books.

Elementary and General.

Photography, Theory and Practice. L. P. Clerc. Ed. George E. Brown. 35s.

The Art of the Photographer. E. Drummond Young. 21s.

First Aid to the Amateur Photographer. Will R. Rose. 2s. 6d.

Amateur Photography. F. T. Beeson and A. Williams. 2s. 6d.

Photography Made Easy. R. Child Bayley. 2s.

Ilford Manual of Photography. New edition. 2s.

Amateur Photographic Handbook. 1s.

Sinclair Handbook of Photography. 1s. 6d.

All about Photography. P. R. Salmon. 2s. 6d.

Barnet Book of Photography. 3s.

The Photographic Instructor. J. I. Pigg. 4s.

Photography: Dr. C. E. K. Mees. 7s. 6d.

Photographic Technique. L. G. Hibbert. 2s. 6d.

Photography: Principles and Practice. C. B. Neblette. 30s.

Instruction in Photography. W. de W. Abney. 7s. 6d.

Dictionary of Photography. E. J. Wall. 7s. 6d.

The Complete Photographer. R. Child Bayley. 15s.
Photography : Principles and Applications. A. Watkins. 10s. 6d.
History of Photography. W. Shepperley. 10s. 6d.
Photography as a Business. Arthur G. Willis. 5s.
Photography as a Scientific Implement. 30s.
The Camera as Historian. H. D. Gower, L. Stanley Jast, and W. W. Topley. 6s.
The Kingdom of the Camera. T. Thorne Baker. 7s. 6d.
Photography To-day. Dr. D. A. Spencer. 3s. 6d.

Optics and Chemistry.

Fundamentals of Photography. C. E. K. Mees. 4s.
Camera Lenses. A. Lockett. 2s. 6d.
The Optics of Photography and Photographic Lenses. J. Traill Taylor. 3s. 6d.
Soft-focus Lenses. (No. 184 of *Photo-Miniature.*)
Modern Telephotography. Capt. Owen Wheeler. 1s. 6d.
Telephotography. C. F. Lan-Davis and Carter. 3s. 6d.
Photographic Chemicals and Chemistry. T. L. J. Bentley and J. Southworth. 3s. 6d.
Photographic Researches of Hurter and Driffield. W. B. Ferguson. 25s.

Special Branches.

Studio Portrait Lighting. Herbert Lambert. 15s.
Commercial Photography. D. Charles. 10s. 6d.
Complete Press Photographer. Bell R. Bell. 6s.
Infra-Red Photography. S. O. Rawling. 3s. 6d.
Practical Infra-Red Photography Dr. O. Helwich. 4s.
The Real Pictorialism. F. C. Tilney. 1s.
Pictorial Composition in Photography. Arthur Hammond. 15s.
Principles of Photographic Pictorialism. F. C. Tilney. 25s.
Photographic Amusements. F. R. Fraprie and W. E. Woodbury. 15s.
Photography on Tour. 6d.
The Portrait Studio. Practicus of the *B.J.* 1s.
Studio Construction. (No. 182 of *Photo-Miniature.*)
Portraiture, Parts I and II. F. C. Tilney. 1s. each.
Lighting in Photographic Studios. P. C. Duchochois. 1s. 6d.
The Studio, and what to do in it. H. P. Robinson. 3s. 6d.
Flashlight. J. J. Curtis. 1s.
Magnesium Light Photography. F. J. Mortimer. 1s. 6d.
Reflex Cameras. (No. 151 of *Photo-Miniature.*)
Speed Photography. (No. 1, *New Photo-Miniature.*)
Photography of Moving Objects and Hand-camera work for Advanced Workers. Adolphe Abrahams. 2s. 6d.
How to Make Good Pictures. (Kodak.) 2s.
Nature Photography for Beginners. E. J. Bedford. 7s. 6d.
Stereoscopic Photography. A. W. Judge. 21s.
Photo-micrography. E. J. Spitta. 12s.
Aerial Photography. C. Winchester and F. L. Mills. 25s.
Airplane Photography. H. E. Ives. 18s.
Modern Miniature Cameras. R. M. Fanstone. 3s. 6d.
Composition for Photographers. R. N. Haile. 10s. 6d.

Monsters and Madonnas : A Book of Methods. W. Mortensen. 20s.
Photography and the Art of Seeing. Marcel Natkin. 10s. 6d.
Practical Stereoscopic Photography. F. M. Dalzell. 10s. 6d.
Free-lance Journalism with a Camera. R. H. Mallinson. 3s. 6d.
X-rays. W. Schell. 7s. 6d.

Negative Processes.

The Wet Collodion Process. Arthur Payne. 3s.
Collodion Emulsion. H. O. Klein. 5s.
Photographic Emulsions. E. J. Wall. 21s.
Perfect Negatives. Dr. B. T. J. Glover. 1s.
The Photography of Coloured Objects. C. E. K. Mees. 2s. 6d.
Photographic Rendering of Colour in Monochrome. B. T. J. Glover. 1s.
The Watkins Manual (of exposure and development). Alfred Watkins. 1s. 3d.
Physical Development. (No. 2, *New Photo-Miniature.*)
The Photographic Darkroom. E. J. Wall. 6s.
Intensification and Reduction. E. J. Wall. 5s.
Retouching and Finishing for Photographers. J. Spencer Adamson. 4s.
Art of Retouching. Robert Johnson. 12s. 6d.

Printing Processes.

Pigment Printing. G. L. Hawkins. 10s. 6d.
Photographic Printing, Commercial and Professional. R. R. Rawkins. 3s. 6d.
Photographic Printing Processes. Owen Wheeler. 8s. 6d.
Print Perfection. Dr. B. T. J. Glover. 1s.
Toning Bromide Prints. R. Blake Smith. 1s. 6d.
Enlarging for All. Dr. B. T. J. Glover. 1s.
Enlargers and Enlarging of To-day. W. Alexander. 3s. 6d.
Carbon Printing. E. J. Wall. 1s. 6d.
Bromoil and Bromoil Transfer L. G. Gabriel. 7s. 6d
Bromoil Printing and Transfer. Dr. E. Mayer. $2·50.
Bromoil and Oil Prints. Jas. A. Sinclair. 2s.
The Art of Pigmenting. Bertram Cox and F. C. Tilney. 1s.
Oil, Bromoil and Transfer. Fred Judge and F. C. Tilney. 1s.
Expression in Pigmenting. F. C. Tilney. 1s.
Oil and Bromoil Processes. F. J. Mortimer and S. L. Coulthurst. 1s. 6d.
Oil and Bromoil Printing. (No. 106 of *Photo-Miniature.*)
Perfection in the Pigment Processes. Chris. J. Symes. 1s.
Kallitype Processes. (No. 185 of *Photo-Miniature.*)
Blue Printing and Modern Plan Copying. B. J. Hall. 6s.
Treatise on the Air-brush. S. W. Frazer and G. F. Stine. 12s. 6d.
The Art of Colouring Photographic Prints. J. C. Tobias. 7s. 6d.

Lantern and Cinematograph.

Optical Projection. R. S. Wright. 4s. 6d.
Lantern Slides. Dr. B. T. J. Glover. 1s.
Practical Slide-making. G. T. Harris. 1s. 6d.
Living Pictures. R. B. Foster, B.Sc. 6s.
Commercial Cinematography. G. H. Sewell. 7s. 6d.

The Guide to Kinematography. Colin N. Bennett. 10s. 6d.
Amateur Cinematography. Capt. Owen Wheeler. 6s.
Cine-Photography for Amateurs. J. H. Reyner. 10s. 6d.
Filmcraft. Adrian Brunel. 3s. 6d.
Making Home Movies. D. C. Ottley. 3s. 6d.
Amateur Films. Alex. Strasser 7s. 6d.
Home Processing. Percy W. Harris. 3s. 6d.
Film-Play Production for Amateurs. G. H. Sewell. 5s.
Cinematography and Talkies. J. R. Cameron and J. A. Dubray. $4.
Amateur Talking Pictures and Recording. Bernard Brown, B.Sc. 7s. 6d.

Process Work.

Ilford Manual of Process Work. L. P. Clerc. 7s. 6d.
Modern Illustration Processes. Charles W. Gamble. 12s. 6d.
Horgan's Half-tone and Photo-mechanical Processes. S. H. Horgan. 12s. 6d.
Photo-Mechanical Processes. W. T. Wilkinson. 4s.
Elements of Photogravure. C. N. Bennett. 5s.

Colour Photography and Colour Cinematography.

Colour Photography. R. M. Fanstone. 12s. 6d.
Practical Colour Photography. E. J. Wall. 15s.
Natural-Colour Photography. Dr. E. König. 3s.
Bye-Paths of Colour Photography. "O. Reg." 5s.
The Technique of Colour Photography. F. R. Newens. 4s. 6d.
The History of Three-Colour Photography. E. J. Wall. $15.
Natural Colour Processes. C. E. Dunn. 10s. 6d.
Colour Cinematography. A. B. Klein. 25s.
Colour Photography. F. R. Newens. 4s. 6d.

Trade Booklets.

The following booklets of technical information are issued by the undermentioned firms in the photographic trade. Except where otherwise stated, the booklets are sent post free to any applicant.

Adhesive Dry-Mounting Co.

Dry-Mounting.
Border Tints and Mounting Boards.

Agfa, Ltd.

Flashlight Photography.
Rodinal Developer.
Development in Bright Light.
Agfa Films and Plates.
Agfa Bromide and Gaslight Papers.
Agfacolor Ciné Film.
Agfacolor Plates and Films (Working Instructions).
Agfa Cameras.
Agfa Amateur Ciné Apparatus and Film.
Agfa Accessories.
Agfa X-Ray Journal.
Agfa Papers and How to Use Them.
Agfa Filters.
Infra-Red Photography.

Aldis Bros.

Aldis Bros. and their Productions.
Aldis Lenses.
The Aldis Epidiascope.
The Aldis Camera Aiming Sight.

Automatic Coil Winder & Electrical Equipment Co., Ltd.

Instructions for Avo Exposure Meter.

Autotype Co., Ltd.

The Carbon Process.

The Carbro Process, working instructions.
The Autotype Photo Stencil Process.
Trichrome Printing.
Photo-Lithographic Transfer Papers.

Burroughs Wellcome & Co.

Toners and Stains in Commercial Photography
Economy in Photography.
Time Tables for Film Tank Development.
Colours on Development Papers and Lantern Slides.
Colours on Lantern Slides by Development.
Photographs in Colour by Toning and Staining.
" Tabloid " Chemicals.
Colour Photography.
Fine Grain Development.
" Tabloid " Desensitiser.

Cinex, Ltd.

Instructions for Paillard-Bolex Camera Model H, Projectors G, G 3, C, K, E, PA, and DA, also Critical Visual Focusser.

Colour Photographs (B. & F.), Ltd.

The Vivex System of Colour Photography.

J. H. Dallmeyer, Ltd.

The Eye of the Camera.
Why a Telephoto Lens ?
Lenses, Cameras, Projectors and Appâratus for Cinematography.
Dallmeyer Lenses and Apparatus.
Why you should insist on Dallmeyer Lenses.
Construction and Capabilities of Sixtus and Ombrux Exposure Meters.

Elliott & Sons, Ltd.

How to make Snapshots that Sell.

Ensign, Ltd.

Photography, Winter's Ideal Pastime.
Ensign Multilite.
(Separate direction booklets are available for every Ensign camera).

Finlay Colour Process.

Guide to the Finlay Process (6d.)

Garner & Jones, Ltd.

Exakta, The Ideal Reflex Camera for small pictures.
Exakta Photo-flash Outfit.
The Projection-Lumimax Enlarger-Projector.

Gevaert, Ltd.

Camera Please !
Reversal Processing of Ciné Films.
Panchromosa Ciné Film.
Vittex Paper.
X-ray Films.
Graphic Products (photo-mechanical).
Photographic Papers for the Amateur.
Gevaert Films for Miniature Cameras.
Gevaert Ciné Films.
Gevaluxe Velours.

Grant, Thos. K.

Lumière Filmcolor.
Lumicolor Film Instructions.
Exposure Tables for Filmcolor and Lumicolor.

Hewittic Electric Co.

Studio Lighting
Wiring Instructions.

Ilford, Ltd.

Ilford Exposure Tables.
Ilford Plates and Films.
Ilford Hypersensitive Panchromatic Films.
Selo and Selochrome Films.
Selo Hypersensitive Panchromatic Roll Film.

Selo Fine-Grain Panchromatic Roll Film.
Colour Filters, with Special Reference to their Use in Photography.
Ilford Bromide and Clorona Papers.
Selo 9·5 mm. Ciné Reversal Films.
Dufaycolor Roll Film and Film Packs.
Slides and Transparencies on Ilford Lantern Plates.
Recent Developments in Infra-red Photography.
Infra-red Photography.
Toning Ilford Bromide and Chlorona.
Ilford Products for Process and Photomechanical Industries.
Ilford Book of Formulæ.
Selo Finer Fine Grain Films.
Selo Films for Perfect Pictures.
Dry Transfer Paper.
Photomechanical Paper.
Fluorazure Intensifying Screens (Levy-West).
Clinical Photography.
Photography as an Aid to Scientific Work.
Selo Fine Grain Reversal 16 mm. (safety) Ciné Film.
Dufaycolor 16 mm. Ciné Film.
Dufaycolor Photography for the Amateur Worker.
Colour Filters, Holders and Safelights.
Document Paper.
Night Photography.
The Selo Works.
The Dufaycolor Process (6d.).
Portrait Panchromatic Film.
Handbook of Dental Radiography.
Panchromatism (6d.).

Johnson & Sons.

Home Photography. 1, Developing. 2, Gaslight Printing. 3, Flashlight. 4, Bromide Printing. 5, Enlarging.
Azol, the Correct Developer.
Vedol, "Scaloid" Developer.
"Pactum" Toners.
Tinting Set.
Flashlight Photography.

Kodak, Ltd.

Eastman Pola-Screens.
Choose the Kodak Film that Suits You Best.
Illumination of Photographic Workrooms.
Translite Paper.
Wratten Filter Factors.
Kodak X-Ray Manual.
Eastman Professional Films.
Transferotype Paper.
Kodak Printing Papers.
Velox (Gaslight) Paper.
Kodaline Reflex Printing.
Kodaline Wet Stripping Film.
Kodaline Film.
Home Movies You Can Afford (Ciné-Kodak Eight).
16-mm. Ciné Kodak.
Dental Radiography.
Kodak Clinical Camera Outfit.
Kodak Studio Outfits.
The Kodak Unit System of Studio Lighting.
How to make Good Pictures (1s.).
Real Orthochromatism (6d.).
The Photography of Coloured Objects (2s. 6d.).
Wratten Light Filters (2s. 4d.).
Elementary Photographic Chemistry (1s.).
The Fundamentals of Photography (5s.).

Kosmos Photographics, Ltd.

The Making of Prints on Vitegas.

E. Leitz (London).

Depth of Focus Tables for the Leica Lenses.
Auxiliary Reproduction Devices.
Large Printer for Leica Lantern Slides.
Filters.
Directions for Use of the Leica Camera.

Stereo Front Attachment.
Flashlight Attachment.
Remote Shutter Release and Winding Device.
Developing and Printing Appliances.
Instructions for Use of the Focomat Enlargers.

Modern Traders, Ltd.

Picture Making with the Matelux.

Pathéscope, Ltd.

Pathéscope Monthly.
Semi-professional Development of 9·5 mm. films.

Sashalite, Ltd.

Sashalite Photoflash Bulbs.

Schering, Ltd.

Artificial Light Photography.
Voigtländer Yellow Filters.
Luminous Exposure Meter.
Exposure Calculator.

Soho, Ltd.

The Soho Reflex Camera.

Taylor, Taylor & Hobson, Ltd.

Cooke Process Lenses.
Taylor-Hobson Cinema Projection Lenses.
Pleasing Portraiture.
The Lens that "Conquered" Everest.

Vanguard Co.

Varnishing Negatives Made Easy.
Firelight Portraits by Daylight.
Colouring Prints and Slides.
Intensification and Reduction.
Saving Over-printed Bromides.

Weston Electrical Instrument Co., Ltd.

Weston Model 650 Universal Exposure Meter Instructions (9d.).
Weston Leicameter Instructions (9d.).
Supplementary List of Weston Film Speeds.

Williamson Manufacturing Co., Ltd.

Eagle Aircraft Camera Types III and IV.
Williamson Gun Camera.
Electric Control for Eagle Cameras.
Half-Plate Enlarger.

Zeiss, Carl.

Zeiss Photo Lenses (On the Choice of a Lens).
Lenses and How They are Made.
The Eagle Eye of Your Camera.
The Tele-Tessar F/6·3.
Zeiss Herotar.
Magnification Slide-Rule for Photomicrography.
Zeiss Mikrotars.
Universal Tessar F/3·5.
Zeiss Biotessar F/2·8.
The New Tessar F/2·8 for Small Film Cameras.
New Extra Rapid Zeiss Photo Lenses.
Zeiss Yellow (Glass) Filters.
Zeiss Photomicrographic Apparatus.
Optical Equipment for Process Work.

Zeiss Ikon, Ltd.

Accessories for Contax Photography.
The Contax Lenses.
The Contameter.
Photographie und Forschung (in English).

Permits to Photograph.

Members of photographic societies which belong to the Photographic Alliance, should consult the "Red Book" which contains complete details of the facilities afforded to members.

London Area.

Westminster Abbey.—From the Chapter Clerk, the Sanctuary, Westminster. Permission is rarely given. A fee of 5s. is required for each photograph.

St. Paul's Cathedral.—From the Dean's Verger. Fee, 2s. 6d. per day.

Tower of London.—From the Resident Governor.

Houses of Parliament.—From the Secretary, Lord Chamberlain's Office, House of Lords.

Guildhall.—From the City Surveyor, Guildhall, E.C. 2.

Picture Galleries (National Gallery, Tate Gallery).—Permission given only to professional photographers.

British Museum.—Special permission granted for use of stand cameras only by application in writing to the Director.

Victoria and Albert Museum.—From the Director and Secretary, South Kensington, S.W.7. There are special restrictions.

Zoological Gardens (Regent's Park and Whipsnade).—A fee of 2s. 6d. (on each occasion) is charged for permission to use a stand camera. Hand-cameras of any size may be used without permit. Ciné hand cameras for sub-standard film may be used by bona-fide amateurs without permit. A fee of £12 is charged for permission to take commercial ciné films. Application to the Secretary, Zoological Society, Regent's Park, London, N.W.

Royal Parks.—No permission required for use of hand cameras, provided that portraits or groups are not taken. For stand cameras, permission requires to be obtained from the Secretary, H.M. Office of Works, Storey's Gate, Westminster, S.W. 1. This applies to Hyde Park, Green Park, St. James's Park, Primrose Hill, Regent's Park, Greenwich Park, Richmond Park, Bushey Park and Hampton Court Park, Gardens and Green.

Other Parks.—Almost all other Parks in the London area are under the control of the L.C.C. Permits to use stand cameras on application to the Chief Officer, Parks Department, The County Hall, Westminster Bridge, S.E. 1.

Kew Gardens.—On payment of 3d. in addition to charge for admission.

Burnham Beeches.—From the Town Clerk, Guildhall, E.C. 2.

Epping Forest and Wanstead Park.—From the Town Clerk, Guildhall, E.C. 2.

Castles.—In most cases on application personally. At Raglan Castle the fee for amateurs is 1s., professionals 10s. Stokesay Castle: amateurs free, professionals £1 1s. In England and Scotland a great many historic buildings are in the charge of H.M. Office of Works.

Provinces.

Cathedrals.—Permission to use a camera in English Cathedrals is obtainable on application, in the great majority of cases, to the Dean. In some few instances no fee is charged.

Photographic Periodicals.

Agfa-Photoblatter, 65-67, Lohmuhlen-strasse, Berlin, S.O. 36.
Allgemeine Photographische Zeitung, Verlag, Jos. A. Detoni, Vienna VI., Mollardgasse 40.
Amateur Cine World, Link House, 4-8, Greville Street, London, E.C. 1.
Amateur Photographer and Cinematographer, Dorset House, Stamford Street, London, S.E. 1.
American Annual of Photography, 428, Newbury Street, Boston 17, Mass,
American Cinematographer, 1222 Guaranty Building, Hollywood, Cal., U.S.A.
American Photography, 428, Newbury Street, Boston 17, Mass., U.S.A.
Atelier, W. Knapp, Mühlweg, 19, Halle a/Saale, Germany.
Australasian Photo-Review, Kodak, (Australasia), Ltd., 379, George Street, Sydney, Australia.
British Journal of Photography, Henry Greenwood & Co., Ltd., 24, Wellington Street, Strand, London, W.C. 2.
British Journal Photographic Almanac, Henry Greenwood & Co., Ltd., 24, Wellington Street, Strand, London,W.C.
Bulletin de l'Association Belge de, Photographie, 230, Avenue Albert Brussels.
Bulletin de la Société Française de Photographie, 51, Rue de Clichy, Paris, IX.
Bulletin de Photogrammetrie, 51 Rue de Clichy, Paris, IXe.
Bulletin of Photography, 636, Franklin Square (Cor. 7th and Race Streets), Philadelphia, U.S.A.
Camera, 636, Franklin Square (Cor, 7th and Race Street), Philadelphia, U.S.A.
Camera, C. J. Bucher, A.-G., Lucerne, Switzerland.
Camera, 2, Crow Street, Dublin.
Camera Craft, 425, Bush Street, San Francisco, Cal., U.S.A.
Le Ciné Amateur, 94, Rue St. Lazare, Paris, IXe.
Civil Service Photographer, 38, Manor Road, Richmond, Surrey.
Commercial Photographer, Abel's Publishing Co., 515, Caxton Building, Cleveland, Ohio, U.S.A.
Correo Fotografico, Suipacha 548, Buenos Aires, Argentine Republic.
Corriere Fotografico, 6, Via Stampatori, Turin, Italy.
Film für Alle, Krausenstrasse 35/36, Berlin, S.W. 19.
Fotographische Rundschau, 19, Mühlweg, Halle, a/S., Germany.
Fotokunst, Dambruggestraat 265, Antwerp.
Focus, Bloemendaal, Holland.
Fotograph Polski, Ul. Czackiego, 3/5, Warsaw.
Gallery (The), 27, Battenhall Road, Worcester.
Home Photographer, 8/11, Southampton Street, London, W.C. 2.
Home Movies and Home Talkies, 8/11, Southampton Street, London.
L'Instantané, 60, Rue Thomond, Paris V.
Jahrbuch für Photographie und Reproduktionstechnik, W. Knapp Halle a/S., Germany.
Kodak Magazine, Kodak, Ltd., Kingsway, London, W.C. 2.
Leica, Geibelstrasse 31, Hanover, Germany.
Lichtbild, Verlay Josef F. Limpler, Haida-Böhmen, Czechoslovakia.
Linse, Derfflingstrasse, 23, Berlin Lankwitz.
Miniature Camera, The, Fenwick G. Small, 1124, Myrtle Avenue, Brooklyn, N.Y., U.S.A.
Monthly Abstract Bulletin, Research Laboratory, Eastman Kodak Co., Rochester, N.Y., U.S.A.
Movie Makers, 420, Lexington Avenue, New York, U.S.A.
Nordisk Tidskrift för Fotografi, Stockholm.
Oesterr, Schmalfilmer, Neubaugasse 40, Vienna VII.
P.P.A. Record, Professional Photographers' Association, 49, Gordon Square, London, W.C. 1.
Photo-Art Monthly, Monadnock Building, San Francisco, Cal., U.S.A.
Photo-Ciné-Graphie, 18 Rue Séguier, Paris, VIe.
Photo-Markt, Mariahilferstrasse 31, Vienna.
Photo-Miniature, 70, Fifth Avenue, New York, U.S.A.
Photo Olzer, Prague.
Photo Pour Tous, 37, Rue Lafayette, Paris-Opera.
Photo-Revue, 118, Rue d'Assas, Paris VI.
Photo-Woche, Lindenstrasse, 26, Berlin.
Photofreund, 33, Stallschreibenstrasse, Berlin, S. 14.
Photograph, L. Fernbach, Bunzlau.
Photographe, 189, Rue St. Jacques, Paris V.
Photographic Abstracts, Royal Photographic Society, 35, Russell Square, London, W.C. 1.
Photographic Dealer, Sicilian House, Southampton Row, London, W.C.
Photographic Journal, 35, Russell Square, London, W.C. 1.
Photographische Chronik, W. Knapp, Halle a/Saale, Germany.
Photographische Industrie, Krausenstr, 35/36, Berlin, S.W. 19, Germany.
Photographische Korrespondenz, Schottengasse 4, Vienna I., Austria.
Photographie für Alle, Krausenstrasse 35/36, Berlin, S.W. 19.

Polski Przeglad, Fotofraficzny, Kasimierz Greger, ul 27, Grudnia 20, Poznan, Poland.
Procédé, 10, Boulevard de la Bastille, Paris, XIIe.
Process Engravers' Monthly, 12, Farringdon Avenue, London, E.C. 4.
The Professional Photographer (formerly Abel's Photographic Weekly), 515, Caxton Building, Cleveland, Ohio, U.S.A.
Progresso Fotografico, Molins de Ray 9, Apartado 678, Barcelona, Spain.
Revue de Photo (Tijdschrift) pour Amateurs, Cyngel No. 2, Bruges (Belgium).
Revue Française de Photographie, 189, Rue St. Jacques, Paris, V.
Science et Industries Photographiques, 3-5, Boulevard Pasteur, Paris XV.
Zeitschrift für Wissenschaftliche Photographie, J. A. Barth, 16, Dörrienstrasse, Leipzig, Germany.

Every care is taken in revising this list, but it cannot be guaranteed complete or accurate in every particular.

Contractions.

B.—mark on exposure shutters, signifying "bulb," that is, setting of the shutter at which shutter remains open as long as the release is pressed.

B. & W.—black and white. Used in description of photographs worked up (in black) with crayon, air-brush, or other method.

B.P.—British Pharmacopœia. Indicates standard of strength and purity of chemicals.

C.—Centigrade. Degree of temperature.

C.C.—collodio-chloride printing paper.

c.c.—cubic centimetre, metric measure of volume. 16·9 minims.

C. de V.—carte de visite, an early size—about $3\frac{1}{4} \times 2\frac{1}{4}$ inches—of portrait photograph.

c.p.—candle power.

C.P.—chemically pure. Trade description of chemicals.

cryst.—crystallised. Indicates the crystalised form of any chemical as distinguished from the dry or anhydrous.

D.—dauer. Marking on German shutters equivalent to B, which see.

D. & E.—day and electric. Used in reference to portrait studios.

D.O.P.—Developing-out paper. Term used in United States for gaslight papers.

DIN.—Designation of plate speeds. The latest German system.

D. & P.—developing and printing. The term is understood to mean the commercial quantity development of roll-film and the making of prints from the resulting negatives. In United States the corresponding description is "Photo Finishing."

F.—Fahr. or Fahrenheit. Degree of temperature.

F.P.—focal-plane (shutter).

F.P.A.—film-pack adapter. Frame for using a film-pack on a plate camera.

H. & D.—Hurter and Driffield. Designation of speed of plates.

I.—instantaneous. Marking on shutters indicating that at this setting the shutter gives one or other of the instantaneous (snapshot) exposures.

M.—moment. Marking on German shutters equivalent to instantaneous.

mm.—millimetre. 100 mm. equal 4 inches, very nearly—3·937 inches.

M.Q.—metol-hydroquinone.

O.—offen. Marking on shutters of German make equivalent to B, which see.

P.C.—postcard. In reference to cameras, plates and printing papers denotes a size of $3\frac{1}{2} \times 5\frac{1}{2}$ inches.

P.O.P.—printing-out paper. Contraction first used (in Britain) for gelatino-chloride print-out paper.

P.S.—plate sunk (mounts).

q.s.—quant. suff. In formulæ, denotes that sufficient of the chemical is to be used to produce a particular effect.

Scheiner.—Designation of plate speeds used in Germany.

sp. gr.—specific gravity. Weight in comparison with an equal bulk of water.

T.—time. Marking on shutters denoting that at this setting the shutter opens on pressing the release and remains open until the release is again pressed.

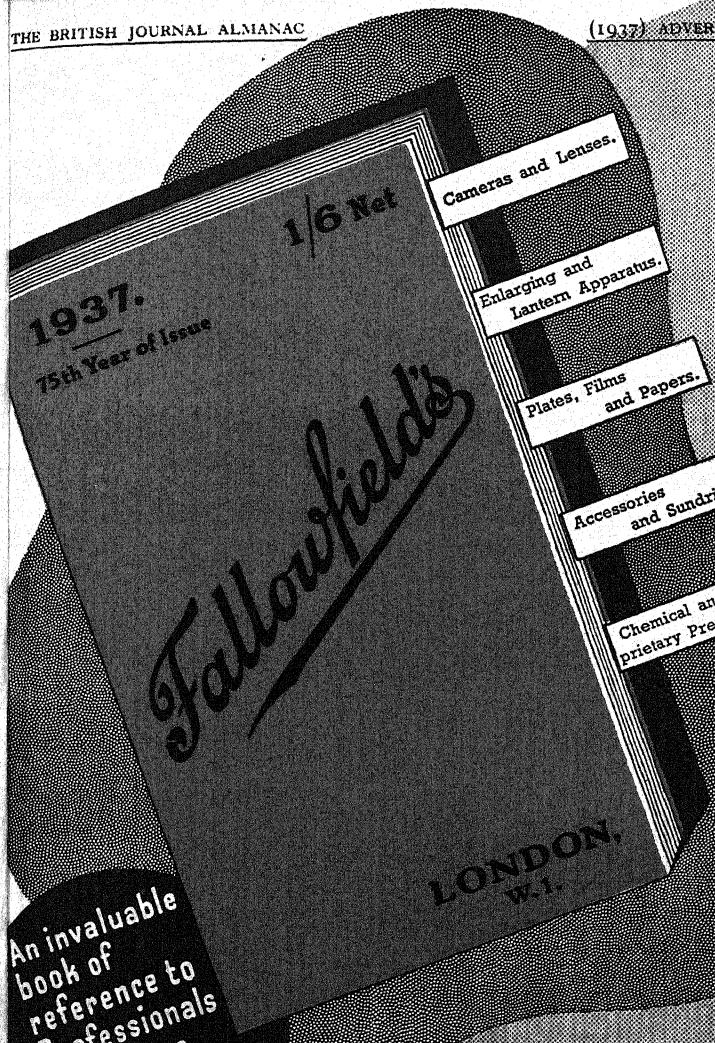
U.S.—uniform system. A system of diaphragm markings according to which $f/4$ is 1, $f/5.6$ is 2, $f/8$ is 4, and so on.

V.P.—vest pocket. Size of camera. Generally understood to indicate a camera taking a picture 45 × 60 mm. in size = $1\frac{3}{4} \times 2\frac{3}{4}$ inches.

W.A.—wide angle (lens).

W.Y.W.—while-you-wait. Applied to portrait studios and also to cameras such as those used in beach photography for making ferrotype and similar portraits.

Z.—zeit. Marking on shutters of German manufacture. It is equivalent to T, which see.



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ALPHABETICAL

A Acetylene Generators, Achromatic Magnifiers, Adaptors, Adhero Machine, Adhesive Tissues, Aerograph, Alarm Meters, Albums, Aluminium Stands, Antinuous Release, Anti-Splash Jet, Aprons, Art Paper, Autochrome.

B Backgrounds, Balances, Ball and Socket Tops, Ball and Tubes, Baths, Bellows, Binding, Binoculars, Blocks, Blotting Books, Bolting Silk, Books on Photography, Border Negatives, Bottles, Boxes for Storing, Bromide Chalks, Bromide Enlargements, Bromoil, Brooches, Brushes.

C Calculators, Calendar Mounts, Camel Hair Brushes, Cap for Lenses, Cases for Cameras, Carriers, Cassettes, Celluloid, Chalk Crayons, Changing Bags, Christmas Mounts, Circle Cutters, Circulator, Clarocit, Clips, Clocks, Cloth for Focusing, Cloud Negatives, Colour Screens, Colours, Condensers, Cover Glasses, Covers for Dishes, Crushers, Cutters, Cutting Shapes.

D Dark-Room Lamps, Dark-Room Pins, Dark Slides, Daylight Slides and Envelopes, Dead Black, Decimal Weights, Desensitizers, Desks for Retouching, Developing Tanks, Developing, Diamonds, Diagram Slides, Dish Brushes, Dishes, Distance Gauge, Dropping Bottles, Drying Rack, Dry Mounting, Dry Mounting Tissues, Drying Machine, Dusting Brushes.

E Earthenware Jugs, Electro-Cardiograph Registrations, Electric Lamps, Electric Heaters, Eliminator Hypo, Embossing Presses, Embossed Tissue, Enlarging, Envelopes, Exposure Meters.

F Fabric, Ferrotype Plates, Field Glasses, Film Packs, Film Albums, Filtering Paper Finders, Firelight Stain, Finger Stalls, Finishing Pencils, Fixing Tool, Fixing Troughs, Flash Lamps, Flashed Opal, Flat Squeegees, Focuser, Focusing Cloths, Folders, Forceps, Funnels.

G Gardee Envelopes, Generators, Glass, Glazing Pads, Gloves, Gramme Weights.

H Heaters, Half-Watt Lamps, Hypo Dissolver, Hypolim.

I Isochromatic Screens.

J Japanese Colours, Jars for Chemicals, Jet Trays, Jugs.

K Kalko Paint, Knives.

L Lamps, Lantern Slide Making, Lead-Lined Sinks, Lead Tanks, Leather Cases, Lenses, Lens Cases, Lens Hoods, Levels, Light Filters,

PREPARED DEVELOPERS

Azol, Certinal, D 50, Fallowfield's, Fasa, Johnson's Cartons, Kodak, Lockyer, Platinotype, Rodinal, Scaloid, Straco, Tabloids, Vanguard, Vedol, X-Ray.



LIST OF SUNDRIES

M Machines for Printing, Magnesium Lamps, Magnifiers for Focusing, Masks and Discs, Measures, Metal Tripods, Meters, Mortars and Pestles, Mountants, Mounts, Mount Cutters and Bevellers, Mounting Machine, Mounting Tissue.

N Nameit Outfits, Negasy's Files, Negative Albums, Night Lights, Non-Actinic Paper, Note Books.

O Opaque, Oval Cutters.

P Packing Material, Paste Brushes, Pastes, Passe-Partout, Pencils, Periodicals, Photopake, Photo Tints, Pins, Plate Boxes, Plate Filters, Plate Washers, Postal Wrappers, Print Clips, Print Finishing Pencils, Print Trimmers, Print Lifters, Print Washers, Printing Frames, Print Drying Machine, Printing Machine, Protector Bags, Push Pins.

R Racks, Releases, Retouching, Robosal, Rods for Stirring, Roller Squeegees, Roll Film Tanks, Rose Sprays, Rubber Gloves, Ruby Fabric.

S Sable Brushes, Safe Light Screens, Scales and Weights, Screens, Shades, Shapes for Cutting, Shutters, Silk Bolting Cloth, Sinks, Sky Shades, Sky Filters, Soap, Spirit Lamps, Spirit Levels, Spotting Brushes, Spotlights, Squeegee Plates, Squeegees, Stands, Stereoscopes, Stirring Rods, Stoneware Sinks, Stoppered Bottles, Storage Albums, Straw Boards, String for Packing, Studio Accessories, Swivel Cutters.

T Tablet Crusher, Tabloids, Tanks, Taps, Telemeters, Telescopic Tripods, Tents, Thermometers, Time Exposure Valves, Tins for Hypo and Chemicals, Tints, Tissue, Titling Outfits, Transparent Paper, Translucent Screen, Trays, Tripods, Trimming Apparatus, Troughs, Twill.

V Varnishes, View Finders, Viewing Boxes, Vignettes.

W Washing Apparatus, Waterproo Aprons, Weights and Scales, White Chinese, Wood Clips, Wooden Tripods, Wrappers Postal.

X X-Ray Requisites.

Z Zinc Cutting Shapes.

• • • • •

SUNDRY PREPARATIONS

Acid Fixing Salts, Backing, Colours, Cleaners, Dead Black, Desensitizers, Flash Powders, Fixers, Glazing Solution, Hardeners, Hypo Killer, Inks, Intensifiers, Mountants, Preservatives, Reducers, Restrainers, Retouching, Revivers, Stains, Toners, Varnishes, X-Ray Fixing Salts.



ANNUAL of PHOTOGRAPHY

From the infancy of photography

the name of Jonathan Fallowfield has stood for all that is best in photographic materials, together with unfailing courtesy and attention.

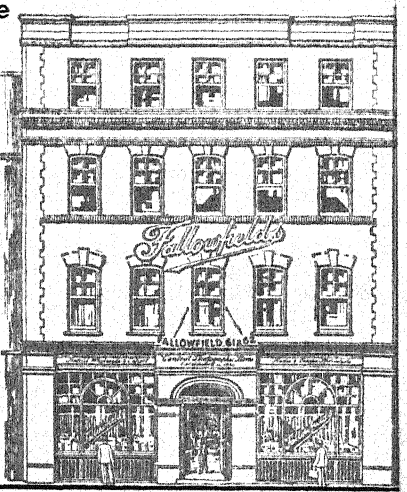
For 80 years our premises in London have been the Mecca of all connected with the world of the camera, because, no matter what they have required they have learned that it can be bought from Fallowfields.

"Bought from Fallowfields" is a recommendation that has stood the test of time. Why not test it for yourself? We cater alike for the Professional, Amateur and the Dealer.

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SINCLAIR OF WHITEHALL

Our Premises, in their central position overlooking Charing Cross to Trafalgar Square, are at the commencement of the noble thoroughfare leading to the Houses of Parliament. "Trafalgar Square" and "Strand" Stations on the Tube Railway are only a few minutes away, and either of the Charing Cross Stations (Southern and Underground) are reached in five minutes. Numerous omnibuses from all parts pass the door.



The Ground Floor, 3 Whitehall

Our Service. The name of Sinclair is synonymous with quality, and we are always ready to help and advise our friends concerning apparatus and materials of our own or other manufacturers. **All goods advertised in this Almanac may be purchased from us.**

Clients Abroad. Our large export trade has been built up by careful attention to Foreign orders. We realise that any error takes a long time to rectify, and every care is taken in testing apparatus before shipment.

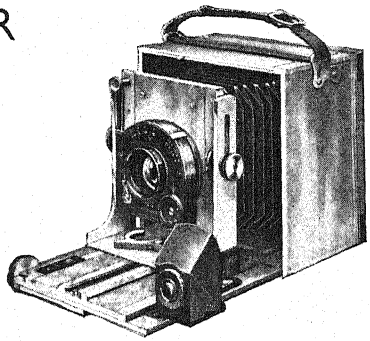
Developing and Printing Service. Our works at Brixton are in delightful surroundings, and we aim at the best work at the lowest possible price. The Sinclair Service in this department has always been recognised as the best.

Ophthalmic Department. We have a special department for eye-glasses and spectacle fitting, and stock all the latest aids to perfect vision. Oculists' prescriptions have every care and attention, for we realise that a perfect fitting frame is as important as the lens it contains.

SINCLAIR LONDON

The SINCLAIR "TRAVELLER UNA"

is a Metal Camera of the Highest Class. $3\frac{1}{2} \times 2\frac{1}{2}$ ($9 \times 6\frac{1}{2}$ cm.) with Ross Combinable Lens (2 foci) and "N.S." Perfect Shutter.



The "Traveller Una" with normal extension as used with the combined lens.

"A joy to look upon, and stands in a class by itself ready for work in any habitable (or practically uninhabitable) part of the globe."—*Photographic Journal.*

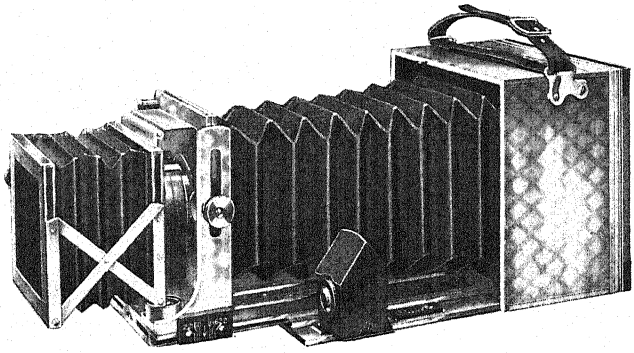
The "TRAVELLER UNA" is built on the same lines as our Standard and Tropical Models, and is particularly suited for Explorers and Scientists who require an instrument to stand the roughest wear and tear. It is made of Duralumin—a metal nearly as light as aluminium but without any of its drawbacks, and is very beautifully finished. It is as well adapted for hand as for stand use, and the lens fitted is perhaps the most generally useful lens made for the practical worker, because not only is it very rapid (F/5.5) but the single elements working at F/11 give a very practical telephoto effect when photographing distant objects such as mountains, etc.

In this camera we have not hesitated to add a little extra weight, so that perfect rigidity is secured when fully extended, either when copying objects the same size or if used for telephoto work. The camera is fitted with two scales, one for the combined lens working at F/5.5 and the other for the single lens working at F/11. It has a tilting finder marked down to show the view given by the combined and single lens. This finder is scaled to show the amount of foreground cut off when the rising front of the camera is in use, and a level is also fitted.

SINCLAIR LONDON

The SINCLAIR "TRAVELLER UNA"

(continued)



The " Traveller Una " with double extension and with Sinclair Lens Hood on front.

The shutter is the " N.S." PERFECT Shutter, giving the speeds required by the practical worker, viz. : from ½-second to 1/100th second, as well as " Time " exposures.

The " TRAVELLER UNA " with its shutter and optical equipment is only sold as a complete unit, and it cannot be supplied without lens or shutter, although other supplementary and Telephoto Lenses can be added to the outfit when desired.

The " TRAVELLER UNA " measures $4\frac{5}{8} \times 3\frac{1}{8} \times 4\frac{5}{8}$ in. (11.7 × 8 × 11.7 cm.). The extension is 10 in. (25 cm.) and the weight, including lens and shutter, is 3 lb. (1.36 kilos).

The Price of the Outfit complete, including Lens and Shutter as described, and three Tropical Model "UNA" Plate Holders £35

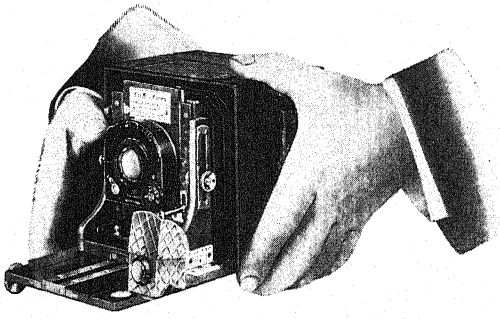
Extra for Sinclair Lens Hood as illustrated, **25**/-

Film Pack Adapters and other Accessories can be fitted as listed on page 456.

SINCLAIR LONDON

The SINCLAIR "UNA"

IS UNRIVALLED FOR HAND OR STAND



Standard Model with "UNA" Tilting Finder Scaled to Agree with the Rising Front of the Camera

For the Photographer who wishes to take pictures without distortion, to render buildings with vertical lines and distant objects in true perspective, the "Una" is unsurpassed.

Striking Comment of an officer of the MOUNT EVEREST EXPEDITION
He writes :

"During the Expedition I gave up using my own Camera, and used entirely one of your 'Una' Cameras we had with us, as I was so taken with the absence of unnecessary movements, and consequent rigidity of the instrument."

Some Press Comments

"Of the 'Una' Camera as an instrument of the best design and workmanship we have occasion to speak in the highest terms. Though it is equal to the widest range of work, it is an instrument of few movements and working parts."
—*The British Journal of Photography.*

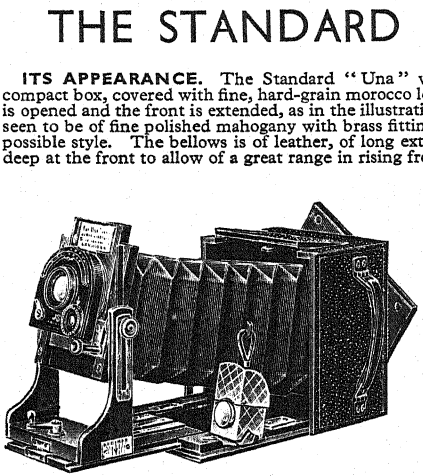
WHY THE "UNA" WINS WORLD-WIDE PRAISE

1. **Because of its workmanship.** Our aim is to make a thoroughly good instrument, perfect in every detail.
2. **Because of its simplicity.** We have introduced the movements required by the practical worker and omitted those that are rarely used and impair efficiency.
3. **Because of its design.** We have given the greatest consideration to the points usually overlooked in camera construction. The design of the rising front, swing front and revolving back is such as to ensure the maximum rigidity when they are in use.
4. **Because of its capacity.** The "Una" is capable of doing everything. It can be fitted with any lens, any form of shutter and any style of plate or film-changing mechanism.

SINCLAIR LONDON

THE STANDARD "UNA"

ITS APPEARANCE. The Standard "Una" when closed appears as a compact box, covered with fine, hard-grain morocco leather. When the camera is opened and the front is extended, as in the illustration, the inner woodwork is seen to be of fine polished mahogany with brass fittings, all finished in the best possible style. The bellows is of leather, of long extension, and is particularly deep at the front to allow of a great range in rising front movement. It will be noticed that when the camera is held in the hand ready for use, the level, finder, and focussing scale are all on the left-hand side and in close proximity to one another—a small point but one of the utmost importance in actual work. Focussing is done by means of a rack and pinion focussing screw, with cross rack to prevent back-lash and this, together with the shutter release, is actuated by means of the right hand. The feature that particularly impresses anyone who has not had experience with the "Una" Camera is the extraordinary rigidity of the front, and it is this that has made the "Una" so popular amongst well-known experts in tele-photography, such as Captain Owen Wheeler and the late Dr. Atkin Swan. It was selected by the Royal Geographical Society for the Mount Everest Expedition. With modern anastigmat lenses the importance of a rigid front is frequently overlooked. In the Sinclair "Una" we have not sacrificed efficiency for the sake of an ounce or two in the weight.



The Standard "Una," showing front raised and tilted, and revolving back

The Sinclair "Una," instead of a detachable reversing back, has a revolving back that may be instantaneously changed from the upright to the horizontal position, even after the shutter of the dark slide is drawn and the plate is ready for use. On the revolving back is a deep hood, which may be quickly removed from the ground glass by pressing a couple of springs, should the hood not be required for any particular work.

The Sinclair "Una" front is solidly made, with a firm base which can be instantaneously clamped to the baseboard. We do not use any clips or springs to hold the front when the camera is brought out to the infinity mark, because in our opinion such spring clips, although perhaps very fairly effective when a camera is new, are likely to soon wear and they militate against the rigidity that is possible when the base of the front is tightly clamped to the base of the camera.

THE SINCLAIR RISING AND SWING FRONT. An important feature of the "Una" is the enormous range of Rising Front movement, and this rising front action is quite independent of the swing front. It will be found in practical work that the rising front is the first movement that the worker requires, particularly with modern anastigmat lenses. The extent of the rising front movement will be found on page 454. The Swing Front is an action more rarely required, and with the "Una" the swing front action is a central swing, and the importance of a central swing will be greatly appreciated by all expert photographers. It permits of the foreground being rendered perfectly sharp at the same time as the more distant objects when using a large aperture lens.

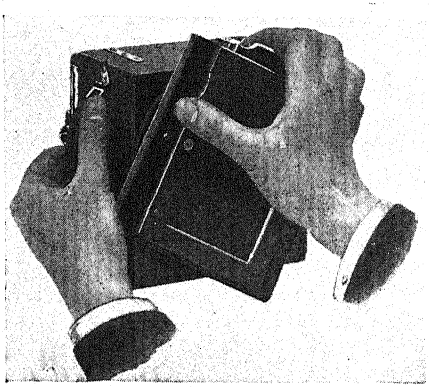
John Russel Pope, Esq., writing from New York, U.S.A., says: "The 5 × 4 'Una' is equal to anything. I am delighted with it, for it is simple and fool-proof."

SINCLAIR LONDON

THE "UNA" EXTENDING BASEBOARD. The Standard "Una" has Double Extension, and this is sufficient to allow objects to be copied the same size with the lens usually fitted. A Triple Extension pattern is also made.

THE FOCUSSING SCALES. These are of real ivory and divided into yards, not into an odd number of feet, which are exceedingly difficult to judge. In practice, yards correspond with strides, and will be found very easy to estimate.

A "DEPTH OF FOCUS SCALE," indicating the depth of focus obtained with various stops, is also fitted.



The Revolving Back of the Sinclair "Una"

THE SINCLAIR "UNA" REVOLVING BACK. This very important improvement permits the plate or film being changed from the vertical to the horizontal position without removing the back of the camera, which revolves on a light-tight turntable.

THE "UNA" DOUBLE PLATE HOLDERS. The "Una" plate holders differ materially from other plate holders apparently similar in design and we have no hesitation in stating that for all but colour work they are far superior to the best book-form slides. For colour plates we supply specially designed book-form slides fitted with improved light-tight valves and draw-out shutters. The features of the "Una" Slide are :—

1. The quality of the pull-out shutters, which are of the **finest hard rubber.** It is very rarely these shutters break, and they can be recommended for tropical use.
2. The valves in the plate holders where the shutters enter are made with the greatest care and ensure a more light-tight fitting than is possible with book-form slides.
3. Each plate holder is fitted with Auto-Safety Catches to obviate double exposure.

THE LEVELS. All cameras are fitted with Levels, the position selected being near the finder and focussing scale.

THE GROUND GLASS SCREEN is covered with a Focussing Hood, so arranged that it can be removed in a moment should a focussing cloth or focussing magnifier be preferred.

THE FINDER. An important part of the "Una" Outfit is the Sinclair Tilting Finder. With most hand cameras the finder is quite worthless when the rising front is in action, and without the rising front is it impossible satisfactorily to photograph subjects in which buildings appear. Our contention is that as good work should be done in the hand as can be done on a tripod, and this is only possible with such a finder as ours. When taking a picture the camera is held level as judged by the spirit level, the finder is then tilted to get the view desired, after which the scale on the rising front is adjusted to agree with the scale on the finder. The exposure is then made.

J. A. Smith, Esq., of the Sarawak Government Offices, writes :—"The best little camera I have ever had."

SINCLAIR LONDON

LENSES. The best camera needs the best lens, and the best lens is of little value without a perfect camera. We use those lenses whose worth have been proved.

SHUTTERS. On the smaller size cameras we use the "N.S." Perfect Shutter (see page 459). The "N.S." Shutter has not the aggravating jump in speed which is such a feature of most diaphragmatic shutters, but is at present only made in small sizes.

DETAILS OF STANDARD MODELS

	Size closed without hood	Extension	Weight with screen but without hood	Extent of rising front	Thickness of hood	Weight of hood
$3\frac{1}{2} \times 2\frac{1}{2}$ in., or						
$9 \times 6\frac{1}{2}$ cm.	$4\frac{3}{4} \times 3\frac{1}{8} \times 5$	$9\frac{1}{2}$ in.	1 lb. 10 oz.	$1\frac{1}{2}$ in.	$\frac{1}{4}$ in.	$1\frac{1}{2}$ oz.
$4\frac{1}{4} \times 3\frac{1}{4}$ in.	$5\frac{1}{4} \times 3\frac{5}{8} \times 6$	$11\frac{5}{8}$,,	2 ,, 6 ,,	$2\frac{1}{2}$,,	,,	$2\frac{1}{2}$,,
5×4 ,,	$6\frac{1}{2} \times 4\frac{1}{4} \times 6\frac{3}{4}$	$12\frac{3}{4}$,,	2 ,, 15 ,,	$2\frac{3}{4}$,,	,,	3 ,,
$5\frac{1}{2} \times 3\frac{1}{2}$,,	$7 \times 4\frac{1}{2} \times 7\frac{1}{4}$	$13\frac{1}{2}$,,	3 ,, 12 ,,	3 ,,	,,	3 ,,
10×15 cm.	$7\frac{3}{8} \times 4\frac{1}{4} \times 7\frac{1}{4}$	$13\frac{3}{4}$,,	4 ,, 2 ,,	3 ,,	,,	$3\frac{1}{2}$,,
$6\frac{1}{2} \times 4\frac{1}{2}$ in.	$8 \times 4\frac{1}{2} \times 8\frac{1}{4}$	$15\frac{1}{2}$,,	4 ,, 8 ,,	$3\frac{1}{2}$,,	,,	4 ,,
7×5 in. or						
18×13 cm.	$8\frac{5}{8} \times 5 \times 9$	17 ,,	4 ,, 12 ,,	4 ,,	$\frac{1}{2}$,,	$4\frac{1}{2}$,,

THE TROPICAL STANDARD "UNA"

THE TROPICAL STANDARD "UNA" is exactly the same design as the regular pattern, but it is made of selected mahogany, brass screwed or bound, and polished on the outside instead of being leather covered. We do not make our cameras in teak, because our experience is that teak is quite unsuited for hot and dry climates.

The "UNA" for High-Power Tele-photography

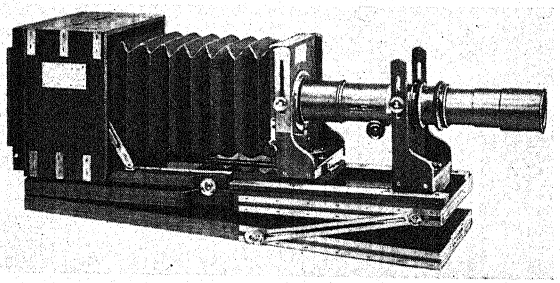


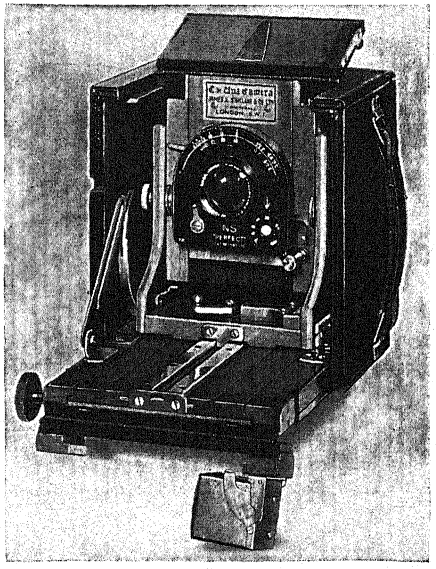
Illustration of Standard Tropical Model "Una" Camera, supplied to H.M. Government, complete with Atkin-Swan Tilting Table and Telephoto Lens.

Otho Webb, Esq., of Queensland, Australia, writes :—"The Everest 'Una' is a beauty—it is so perfectly built. Everyone has fallen in love with it."

SINCLAIR LONDON

The SINCLAIR WIDE ANGLE "UNA"

Our Standard "Una" was designed for the photographer who wished for an instrument with which it was possible to fill efficiently 99 per cent. of his possible requirements. The rigid baseboard of the Standard "Una," with the body and the front of the camera at right angles to it, enables the optical qualities of modern lenses to be used to the greatest advantage. It, however, does not permit of lenses of extreme wide angle. For those who wish to do such wide angle work we have designed a special model which does not need the abandonment of the rigid baseboard, and which preserves the other features which have given such satisfaction for so many years.



The W.A. "Una" showing the front dropped when using a Wide Angle Lens.

In the case of the Wide Angle "Una" the release of a small catch enables the moving portion of the base which carries the front to which the lens and shutter are attached, to be racked back into the body of the camera. The front portion of the base carrying the finder can then be dropped, and so does not interfere with the view given by the widest angle lenses.

The Wide Angle "Una" is also fitted with a bush on the top of the camera, as well as the one in the baseboard. This upper bush enables the camera to be used in a position where a very large falling front is required, such as is necessary in copying when it is desired to see the top of the object, and at the same time to keep the lines vertical. The illustration of this camera, which was made with a similar camera placed on a stand with the front dropped as described, will show the value of this addition. All the illustrations in this catalogue were made with the Sinclair "Una," and in most cases this falling front movement was used. The extra cost of the Wide Angle Model is **£2 0 0** on the prices of the Standard and Tropical Models.

A TRIBUTE FROM PAPUA

Port Moresby, August 21st, 1936

"You may be interested to know that I am using a ½-plate Tropical Model 'Una' which has been in use for over 30 years in the tropics and is still doing good work."—A. G.

SINCLAIR LONDON

PRICES

STANDARD MODEL "UNA" CAMERA, with "Una" Tilting Finder scaled to agree with rising front on camera, Level, Focussing and Depth of Focus Scales. Three Double Plate Holders, "N.S." Perfect or other suitable diaphragmatic shutter and fitted with lenses as follows:—

Lenses	3¼×2½ and 9×6½cm.	¼-plate	5×4 or 9×12cm.	10×15 cm. or 5½×3½	½-plate	7×5 and 13×18cm.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Ross Homocentric F/6.8	21 10 0	23 0 0	26 10 0	27 0 0	32 10 0	36 10 0
Ross Xpres, F/4.5 ...	23 10 0	26 10 0	29 0 0	32 0 0	36 10 0	41 10 0
*Ross Combinable, 2 foci F/5.5 & F/11	28 0 0	31 10 0	34 10 0	37 10 0	42 0 0	46 10 0

* These prices include Cameras with Triple Extension.

TROPICAL MODELS. Extra on above prices.

£3 10 0 £3 10 0 £4 0 0 £4 0 0 £4 0 0 £4 0 0

Triple Extension on Standard and Tropical Models, **£2 0 0** extra on all sizes

ACCESSORIES FOR "UNA" CAMERAS

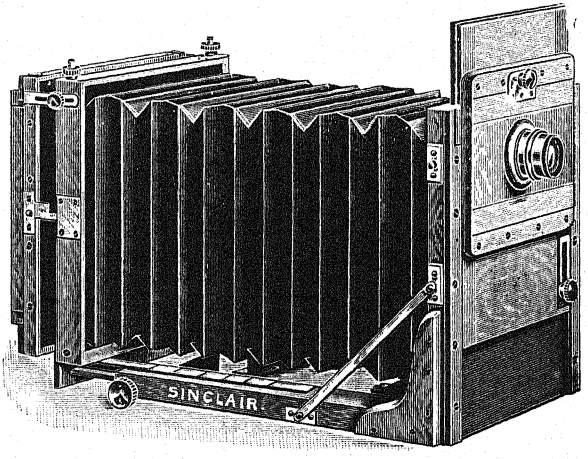
	3¼×2½ and ¼-plate	5×4 and 9×12cm.	10×15 cm. and 5½×3½	½-plate	7×5 and 13×18cm.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Extra Double Plate Holders each	1 2 6	1 8 0	1 11 6	1 17 6	2 2 0
Extra Tropical Spanish Mahogany Plate Holders each	1 7 6	1 13 0	1 16 6	2 2 6	2 7 6
Special Book-form Plate Holders, suitable for Autochrome, Agfa, or ordinary Plates	2 2 0	2 7 6	2 10 0	2 15 0	3 0 0
Ditto, Tropical Model ...	2 7 0	2 12 6	2 15 0	3 0 0	3 5 6
Leather covered Film Pack Adapter ... ... each	2 15 0	3 0 0	3 5 0	3 10 0	4 0 0
Ditto, Tropical Model ...	3 5 0	3 10 0	3 15 0	4 0 0	4 10 0
Hand-sewn Leather Case, with lock and key, to hold Camera and three Slides	3 5 0	3 15 0	4 0 0	4 15 0	5 5 0
Ditto, for Camera and six Slides	3 15 0	4 5 0	4 15 0	5 10 0	6 0 0
Web-sling Shoulder Strap for Camera Case	0 10 6	0 10 6	0 10 6	0 10 6	0 10 6
Graflex Roll Holder, including fitting	4 15 0	5×4 5 5 0	5½×3½ 5 5 0	—	6 2 6
Ditto, Tropical Model ...	6 6 0	6 16 0	6 16 0	—	7 15 0

Atkin-Swan Tilting Table, for use with high power Telephoto Lenses Price, for all sizes illustrated on page 454 ... ... **£7 10 0**

SINCLAIR LONDON

THE SINCLAIR "TECHNICAL" CAMERA

As supplied to The War Department, His Majesty's Indian Government, The New South Wales Government; The Crown Agents for the Colonies; Southern Rhodesia; The Siamese Government; The Egyptian Government; Engineering Works and Scientific Institutions.



This Camera in its general character is of the square bellows long-focus type but has a number of improvements in design, making it the most efficient of its class and particularly suitable for Professional, Technical and Scientific work. It is made of the best seasoned Spanish Mahogany, and great care is taken to ensure parallelism between front and back, an important matter with modern anastigmat lenses.

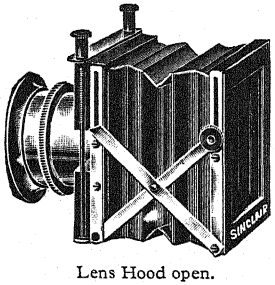
THE RISING AND FALLING FRONT. As will be seen from the illustration there is a very **great rising front movement**, and there is an **equally great falling movement.** This is attained by means of a moving panel at the back of the rising front, and which may be adjusted so that either a great rise or a great fall is secured.

THE SWING BACK. A central swing is provided, and the arms are as long as possible, so that the greatest range of movement may be obtained. By means of the clamping screws on the top of the camera a side swing can also be obtained for special work.

	$6\frac{1}{2} \times 4\frac{3}{4}$	$8\frac{1}{2} \times 6\frac{1}{2}$	12×10	15×12
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Camera and 3 Double Dark Slides	30 0 0	35 0 0	40 0 0	50 0 0
Ditto, Brass Bound	33 10 0	39 0 0	45 10 0	56 10 0
Extra Double Slides ... each	3 0 0	3 5 0	4 10 0	6 0 0
Extra Brass Bound Double Slides each	3 10 0	3 15 0	5 5 0	6 17 6

SINCLAIR LONDON

THE "SINCLAIR" ADJUSTABLE LENS HOOD AND SCREEN HOLDER



Lens Hood open.



Closed

PREVENTS FOGGY NEGATIVES

A Typical Testimonial

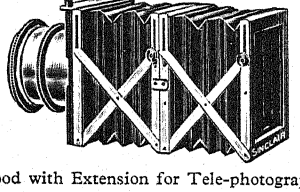
Sheffield.

Lens Hood to hand. It is a beautiful piece of workmanship and very efficient. I have already used it with great success.

W. F. A.

"The practical photographer will be wise in regarding this accessory as an indispensable part of his equipment."

British Journal of Photography.



Hood with Extension for Tele-photography.

No one who has once used the bellows hood of this form is likely to expose another plate without it. It enormously increases the brilliancy of the result and permits of photographs being taken against the sun which would otherwise be impossible. The Sinclair Lens Hood is not only adjustable as regards the extension, but also in its range for fitting to the hoods of lenses, and consequently, the same lens hood will fit a large number of lenses, and the vice grip permits of it being securely held in position. Each hood is also fitted with a spring screen holder, permitting screens to be instantly changed or removed. The same screen will therefore suffice for any lenses which the hood will fit, and the necessity for special caps or screw-in cells is obviated. In cases where lenses are fitted to shutters or are in sunk mounts, a small metal hood to screw into the front cell of the lens may be necessary, which we, or any maker or dealer, would supply.

Size	Adjustable to fit Hood of Lenses from	Extension up to	Size closed	Price	K1, K2, X1 or X2 Screen to fit
No. 00 ...	1 to 1½ in.	2⅜ in.	3 ×2⅛×1	**25/-**	**8/-**
No. 1 ...	1½ to 2 in.	2½ in.	3⅜×3 ×1⅛	**30/-**	**10/-**
No. 2 ...	2 to 2½ in.	3 in.	4⅛×3⅛×1⅛	**35/-**	**12/9**
No. 3 ...	2½ to 3 in.	4 in.	5½×4½×1⅝	**57/6**	**18/6**
Large Hood	Opening 5½×4 in.	5¾ in.	5½×7 ×1½	**60/-**	—

For Studio and Kine' Cameras.

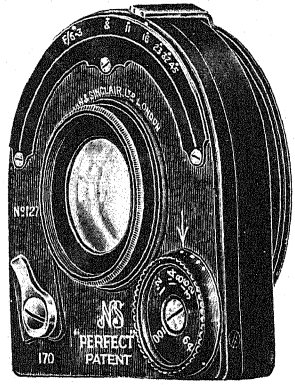
Collapsible Extensions may be had for Nos. 1 and 2, and these increase the lengths when open to 4¾ and 6 inches respectively. Such extensions cost for No. 1, **20/-** and No. 2, **25/-**. They are very advisable for Tele-photography.

SINCLAIR LONDON

THE "N.S." SHUTTER

NO VARIATION
GREAT EFFICIENCY
SMOOTH IN ACTION

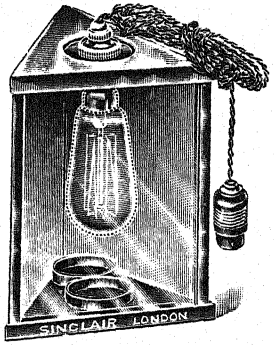
The " N.S." Shutter gives the speeds most useful to the practical photographer and those that work conveniently with the lens apertures, viz., ½, ¼, ⅛, 1/32, 1/64 and 1/100th second.



	Iris Aperture	Tube Diameter for Lenses	Price
No. 0 Size	... 7/8 in.	1-1/16 in.	£4 0 0
No. 1 Size	... 1 in.	1-3/8 in.	4 0 0

When Lenses are ordered from us fitted to this Shutter there is no extra charge for fitting. The charges for fitting customers' own lenses range from 17/6 to 30/-.

THE "SINCLAIR" FOLDING COPPER LAMP



This is a thoroughly well made lamp, constructed of copper in such a way that it will take safelights 8½ × 6½ in., and arranged with "bayonet" or "screw" adapter for attachment to electric light fittings. Where there is no electricity, the aperture which takes the electric light fitting is closed by a screw cap, and either "Sinclair Devolights" or Fairy Night Lights may be used for illumination. Folding flat and being non-rustable it will be welcomed by travellers.

Price, complete with 6ft. of flexible wire and lampholder, together with one 8½ × 6½ in. Wratten Safelight of any grade is	35/-
Extra Adapter so that the Lamp can be used with either "bayonet" or "screw" fitting ...	5/6
Extra Safelights ... each	5/6

Tropical "Devolights" for use with this Lamp if electricity is not available per doz. 2/6

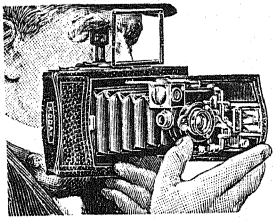
When ordering, state whether Lamp is required with "bayonet" or "screw" fitting.

SINCLAIR LONDON

THE SINCLAIR FRAME FINDER AND VIEW METER

Saves Plates, Films and Disappointment

The unreliability of many camera finders has led to our designing a simple form of frame finder, which is valued by the practical photographer.



THE SINCLAIR FRAME FINDER can be kept on or removed from the camera as desired.

THE SINCLAIR FRAME FINDER is collapsible and goes into a very small space.

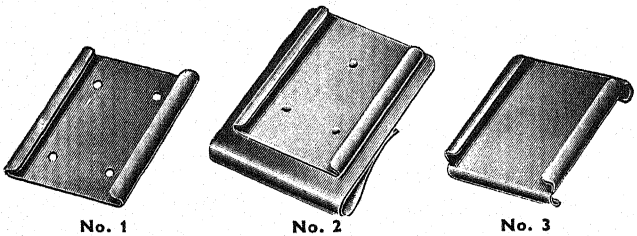
THE SINCLAIR FRAME FINDER can be accurately adjusted to show the picture taken by any camera with a large range of lenses.

THE SINCLAIR FRAME FINDER is equally suitable for the professional with a large stand camera, as for the amateur with a Vest Pocket Kodak.

THE SINCLAIR FRAME FINDER permits of the camera being used at the eye level—the natural position.

THE SINCLAIR FRAME FINDER consists of a collapsible frame made of brass, attached to a base in the form of a lazy tongs that has at the other end a folding sighting plate. When closed, it measures 3 in. × 1¾ in. × ½ in. and weighs only 2 oz.

The finder is designed to slide into a variety of fittings that are made for all types of camera. When not in use, the folded finder can be kept on the camera or, if more convenient, carried in the waistcoat pocket.



No. 1 **No. 2** **No. 3**

THE SINCLAIR FRAME FINDERS are made in two types and each type can be had with 3 kinds of fitting.

Type 1. For plates and films of the normal proportions, such as ¼-plate, 5 × 4 in., ½-plate, etc.

Type 2. For long, narrow pictures such as given by the V.P.K., No. 1A and 2C Kodaks and postcard size.

The fittings are as follows :—

No. 1. Standard fitting, for cameras with wooden bodies to which the fitting can be screwed, and into which the Finder fits.

No. 2. Spring fitting, for attachment to metal cameras such as Folding Brownies, Carbines, Ensigns and V.P.K. Models B and III.

No. 3. Special fitting for use on the original Vest Pocket Kodak, no screwing being necessary.

Price :

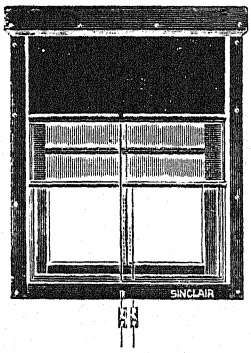
Either type of Finder with one fitting of either number **6/-**
Extra fittings Nos. 1 and 3 ... each **9d.** Extra spring fittings No. 2, each **1/6**

SINCLAIR LONDON

THE SINCLAIR DARK ROOM BLINDS

AT ONCE CONVERT ANY ROOM INTO A DARK ROOM

"One of the things which we all at times make, or get made for ourselves, usually in a rather unsatisfactory way, has been done very well indeed by Mr. J. A. Sinclair's firm."—*British Journal of Photography*.



This consists of a well-made varnished wood frame with two grooves, in which red and black blinds travel, and when both are down no trace of white light is admitted. We make the fitting to any measurements, and we shall be pleased to give quotations on application. Screws are supplied with the blind, and all that is necessary is to screw it to the window frame.

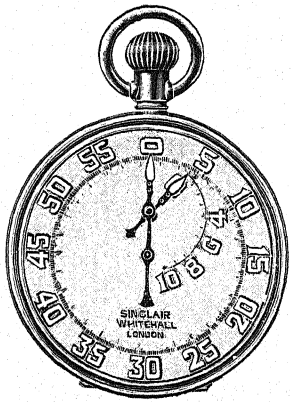
Specimen Size and Price:

Size about 5 ft. × 4 ft.	£9	0 0
„ „ 7 ft. × 4 ft.	10	0 0

Quotations given for any size.

DARK ROOM RADIANT TIMER

Panchromatic and Colour Plate workers in particular will appreciate this new kind of luminous watch. The large figures on the outer edge indicate the seconds, and on the inner scale from 0 to 10 indicating minutes, as well as points for each second, are made of a very radio-active compound which shows clearly in the dark. A pressure of the knob at top starts the two luminous hands from zero, a second pressure stops them, and a further pressure returns them to zero again. The luminosity is greatly intensified if the Timer is held near an electric light bulb before commencing work.



Price .. £3 12 6

SINCLAIR LONDON

THE "SINCLAIR" HIGH POWER FOCUSSING MAGNIFIER X.4

Will be appreciated by those doing copying work or in subjects where very critical focussing is essential. Glasses with great magnifying power are usually so short that it is difficult to get the head sufficiently close to the ground glass focussing screen. In the case of the "Sinclair" Magnifier the tube is 6½ in. long, and the end which is placed into contact with the ground glass is sufficiently large to keep the glass steady when moving it over the surface. It reverses the image, and consequently the picture on the screen is seen the right way up.



It is sold in a leather covered carrying case measuring 6¾ × 1¾ in., and the weight, complete with case, is 6½ oz.

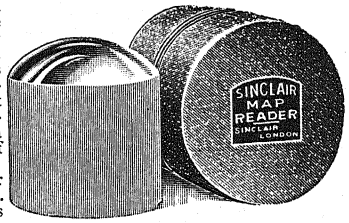
Price, in case complete **£2 2 0**

THE "SINCLAIR" MAP READER

This Reader consists of a solid block of glass, which stands on the map, photograph, postage stamp or other article which it may be desired to examine. No special focussing is necessary, and motorists can examine details of their maps without stopping their cars. Curio collectors will appreciate the ease with which they can examine details of the signature, etc.

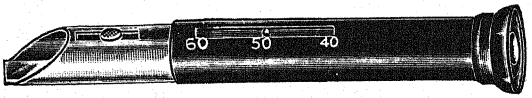
The Reader is sold in a leather covered case, measuring 1¾ × 1¾ in. (45 × 45 mm.) and the weight is 4½ ozs.

Price, in case complete ... **7/6**



PEN MICROSCOPE

These Microscopes have the great advantage that they possess high power in a small space and are wonderfully convenient to use. The No. 1 pattern is like a fountain pen in appearance and magnifies 25 times. The No. 2 pattern as illustrated is rather larger in size and is fitted with achromatic lenses giving a larger



field and magnification 40 to 60 times. The end of the microscope is placed on the surface to be magnified, and a sliding stud enables sharp focus to be secured. They are invaluable for examining signatures, botanical specimens and any fine detail.

No. 1.	25 times	**4/6** each	
No. 2.	40 to 60 times	**17/–** „	with pocket case, **20/–**
No. 2A.	Ditto, screw focussing ...	**20/–** „	with pocket case, **22/6**
No. 3.	40 to 120 times, with stand	**65/–**	

SINCLAIR LONDON

SINCLAIR BROMOIL REQUISITES

BOOKS.—All photographic handbooks are supplied.

"Bromoil and Transfer," by L. G. Gabriel .. **7/6**

"Pigment Printing." The Bromoil Process from the negative to the transfer. 37 Photogravure illustrations and numerous half-tones, by G. L. Hawkins, M.C., F.R.P.S. **10/6**

"The Art of Pigmenting," by Bertram Cox and F. C. Tilney **1/-**

"Expression in Pigmenting," by F. C. Tilney .. **1/-**

"Perfection in the Pigment Processes," by Chris J. Symes **1/-**

"How to Make a Bromoil Print," concise instructions by James A. Sinclair, F.R.P.S. .. Post free on application.



SINCLAIR TRIAL OUTFITS

Containing the essential requisites for beginners with Bromoil.

Boxed complete.

Price, 10/6

Postage in U.K., **6d.** extra.

PAPERS FOR THE BROMOIL PROCESS

Double Weight: White, Smooth or Rough: and Cream, Smooth or Rough.

$6\frac{1}{2}\times4\frac{1}{2}$			$8\frac{1}{2}\times6\frac{1}{2}$	10×8	12×10	15×12	
7 pieces	6 pieces	...	1/6	2/2	3/3	4/11	per doz.
1/3	12 pieces	...	3/-	4/2	6/4	9/6	,,

ACCESSORIES.

Slabs—for pigmenting, 10×8, **2/-**; 12×10, **3/-**; 15×12 ... ... **4/6**

"Clairo"—a non-inflammable fluid for cleaning oil pigment brushes—per bottle, **1/6** and **2/6**

Pigmenting Palettes—plate glass, ground surface and edges. This is the best palette ... ... each **3/-**

Palette Knives ... ... ,, **2/-**

Blotting Boards—special thick, fluffless, 25×20, **5d.** per sheet; per doz. **4/-**

Retouching Lancets—for removing defects or scraping up lights in prints (see page 467) ... ... per box **2/-**

Oil Stumps—for retouching and putting lights in wet prints, per doz. No. 1 **5d.** No. 2, specially fine ... ... per doz. **6d.**

Spirit Sensitizer—for Oil prints, including Blanchard Brush, per bottle **1/9**

Flat Hog Hair Brushes—for use with Spirit Sensitizer ... ... each **3/-**

Tabloid Sensitizer—(B.W. & Co.) ... ... per carton **1/-**

Metal Clips—for hanging up prints to dry ... ... per doz. **2/3**

Varnish for Oil Prints ... ... per bottle **2/3**

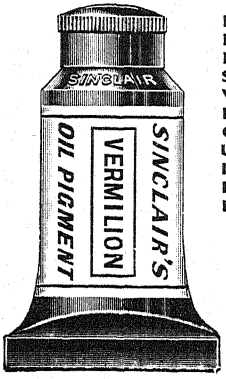
Plastic Rubber—This may be moulded to any shape and is most useful for working on wet prints ... ... per piece **4d.**

SINCLAIR FINISHING RUBBER—For strengthening lights on any prints. Almost magical in its effect ... ... per piece **6d.**

SINCLAIR LONDON

SINCLAIR'S IMPROVED BROMOIL PIGMENTS

ARE THE EASIEST TO USE



Colours.

BLACK	BURNT SIENNA
BROWN	ZINC WHITE
BROWN BLACK	VERIDIAN GREEN
SEPIA	FOLIAGE GREEN
WARM SEPIA	CADMIUM YELLOW
BURNT UMBER	LIGHT YELLOW
COBALT BLUE	RED CHALK
ULTRAMARINE	VERMILION
INDIGO	CRIMSON LAKE

ENCRE MACHINE. A hard warm black ink.
ENCRE TAILLE DOUCE. A soft ink to mix with Encre Machine.

These two last are the inks used by Messrs. Demachy, Puyo, Read, etc.

All above colours, **1/3** per tube.

Special Colours for Three-Colour Work, **2/6** per Tube.

MEDIUMS for thinning the Colours.

The Roberson Medium—For quick drying. **6d.** per Tube.

The Sinclair Bromoil Medium—A slow drying medium especially useful in the Transfer Process. **2/3** per large tube.



THE SINCLAIR BROMOIL BLEACHER

Needs no Acid Bath and makes Pigmenting a pleasure.

The Sinclair Bleacher is made from our improved formula, which enables a Bromoil to be made from a more delicate print than is usual with work of the published recipes.

It is used by many leading experts.

10 oz. concentrated solution ... **2/-**

Post Free in U.K., **2/6**

SINCLAIR LONDON

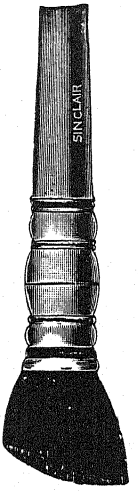
SINCLAIR BROMOIL BRUSHES

Genuine Pole-cat Fitch Brushes.—These are undoubtedly the best brushes for Oil and Bromoil work and will last for years if carefully used.

No. 1, **1/6**	*No. 5, **2/6**	No. 12, **7/6**	No. 18, **16/-**
No. 2, **1/7**	*No. 8, **4/6**	No. 14, **9/6**	No. 20, **22/6**
*No. 3, **1/10**	*No. 10, **6/-**	No. 16, **12/6**	No. 24, **31/6**
	No. 28 ... **50/-**		

Small size for detail work, B, **8d.**; C, **9d.**; D, **10d.** each.

* Nos. 3, 5, 8 and 10 are also supplied "straight cut" instead of bevel shape, and are for use with a "Hopper."



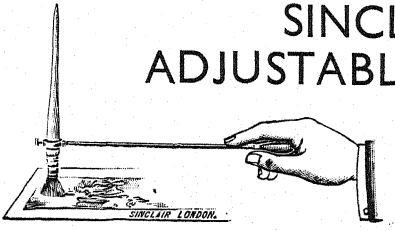
"B" Series Bromoil Brushes.—These Brushes were introduced by us when pole-cat hair was practically unobtainable and are of excellent quality but have less resiliency.

No. 0, **1/-**	*No. 5, **1/6**	No. 14, **3/6**	No. 24, **9/-**
No. 2, **1/3**	*No. 8, **2/-**	No. 18, **6/-**	No. 28, **10/6**

"Mortimer" Brush.—This Brush is made of long and fine hog hair, shaped like our Fitch Brushes, and will be appreciated by those who desire broad effects. It is used by the Editor of the "Amateur Photographer."

No. 1, ¾ in. ...	**3/6**	No. 3, 1¼ in. ...	**6/9**
No. 2, 1 in. ...	**5/-**	No. 4, 1½ in. ...	**7/6**

SINCLAIR ADJUSTABLE HOPPER



A valuable adjunct for increasing contrast over small areas and for working clouds into the sky.

Price, **2/6** each.



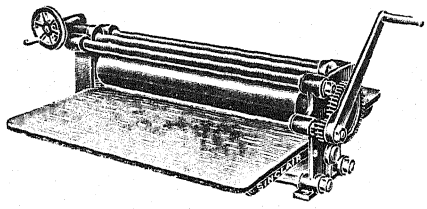
A NON-FLAM CLEANING FLUID

For Cleaning Oil Pigment Brushes, Invaluable for Cleaning and Restoring Cine Films, and the Best Cleanser and Cleaner for the Home. Cleans without injuring Silks, Satins, Woollens, Linens, Kid Gloves and Shoes, Gramophone Records or Typewriters.

Bottles, 1/6 and 2/6 each.

SINCLAIR LONDON

BROMOIL TRANSFER PRESS



The beauty of the transfer process appeals to everyone. By its means is obtained a peculiar quality very similar to that of photogravure. This Press is specially designed for the process, its features being :—

Perfect alignment of rollers, eliminating the need of a blanket, and ensuring a clear cut impression without creep.

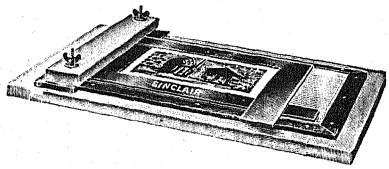
Simple and effective pressure loading device, giving the finest adjustments by the single motion of the hand wheel.

Ease and evenness of operation through the reduction gearing of ratio 3 to 1, giving easy turning with one hand.

Dimensions : Roller Diameters 3⅛ inches. Effective Width of Rollers 20 inches. Table 23 × 23 inches. Approximate Weight 100 lbs.

Price, inclusive of Zinc Sheets **£11 15 0**

THE "REVELLE" BROMOIL TRANSFER DESK



This Desk was designed by Mr. A. Hamilton Revelle, a very clever and artistic worker, and it is particularly adapted for those who work in the smaller sizes, say up to 8½ by 6½ in., or who wish for further power of control when transferring.

It consists of a drawing board 16 in. by 11½ in., in which is framed a piece of plate glass. Two zinc squares are adjustable to hold the reversed Bromoil print, and these, as well as the transfer paper, are firmly held in position by a clamping board at one end of the desk.

The transfer is made by pressing a " tool " on the back of the transfer paper. With this desk re-inking is unnecessary. The progress of the print can be repeatedly examined, and continued action of the " tool " on the back of it will gradually increase the strength in that part. It is evident that this desk affords scope for much selective treatment in pictorial work. Price, **25/-**

Postage and Packing in the U.K. **9d.** Transfer Tools, **3/-** each.

SINCLAIR LONDON



THE "N.S." UNIPOD

Invaluable for users of clockwork driven Kine Cameras and greatly appreciated by hand-camera workers who wish to give the slower exposures satisfactorily.

It is impossible to do justice to this well-designed Unipod in our illustration. In appearance it is like a walking-stick when closed, beautifully finished with black enamel, and is 37½ inches long. It extends to 68 inches and is absolutely rigid. It is constructed of drawn steel tube, and the inner section is nickel-plated with dull finish as a protection against rust. The black wooden knob is removed for use, and it can be supplied with ¼-inch Whitworth or Continental screw thread. When a camera is on this Unipod it can easily be held rigidly for exposures of ¼, ⅛ and 1/16 second.

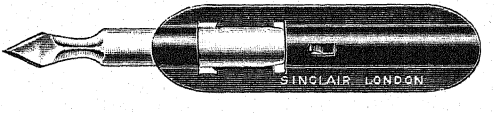
Weight, 1½ lb.

Price . . 35/-

Adapter, so that Unipod can be used with both ¼ Whitworth and Continental thread 7/6

Leather Sling Handle 1/9

THE PEN PRINT TRIMMER and RETOUCHING LANCET



This admirable little instrument should be kept in every photographer's pocket, or on the workroom table. For trimming prints, scraping out defects, or inserting a high light it is the best tool available, and being made of the finest steel it can be sharpened to a keen edge.

Nickel Boxes containing 20 Lancets
Price, including Holder .. per box 2/-

SINCLAIR LONDON

WE STOCK MOVING PICTURE CAMERAS AND PROJECTORS

FOR AMATEUR AND PROFESSIONAL USE

AGFA
BELL & HOWELL
BOLEX
DE VRY
ENSIGN
NEWMAN-SINCLAIR
PATHE
SIEMENS & HALSKE
VICTOR
ZEISS

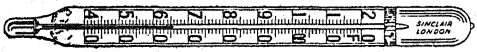
KODAK

MINIATURE CAMERAS OF ALL THE LEADING MAKES

We hold a full stock of Leica Cameras and Accessories and specialise in Developing, Printing and making Lantern Slides from Leica films.

THE "SINCLAIR" LEGIBLE THERMOMETER

This Thermometer will be found of great value when working with red and green safe lights, the scale being a very open one, and the figures of a large size.



The former has a range of from 40° to 120° F. and the scale is of opal contained in a glass tube and consequently unaffected by chemicals. The mercury tube has a magnifying lens front. The thermometer is sent out in a cardboard case and is 8½ in. long.

Price .. 6/6

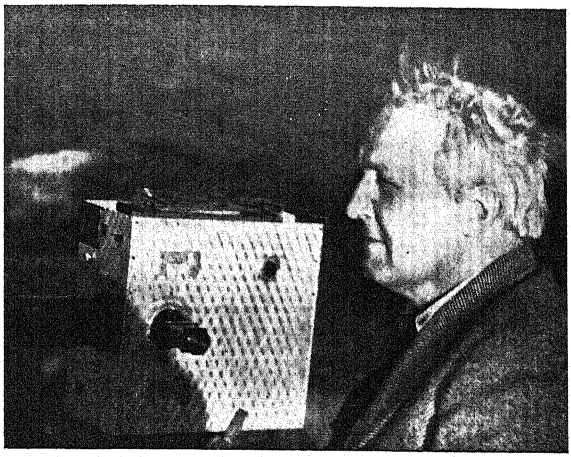
SINCLAIR LONDON

"N.S."

AUTO KINE' CAMERAS

(Newman and Sinclair's Patents)

REGULAR, STUDIO and SLOW MOTION MODELS



Mr. Robert J. Flaherty filming "Man of Aran" with the "N.S." Auto Kine' Camera.—*by courtesy of the Gaumont-British Picture Corporation Ltd.*

THE MOST MARVELLOUS CLOCKWORK-DRIVEN CAMERAS IN THE WORLD.

Amongst notable users may be mentioned:—

H.M. Admiralty.
H.M. Air Board.
H.M. Post Office.
The Empire Marketing Board.
The London County Council.

SINCLAIR LONDON

THE "N.S." AUTO KINE' CAMERA—Regular Model—*cont.*

The "N.S." Auto Kine' Camera is the only instrument driving nearly 200 ft. 35 mm. film with one winding and at a practically constant speed throughout the run within a variation of only 4 per cent. The speed can be varied from 10 to 24 frames per second. The starting and stopping are instantaneous, and no film is wasted in getting up speed. No tripod is necessary when using normal focus lenses, and the camera can be used as easily as a hand camera.

The addition of a Unipod relieves the operator from supporting the weight of the camera and does not detract from its portability or the facility with which it can be directed and operated. With the "N.S." Auto Kine' Camera one may photograph from the ground level or from the top of a ladder, in a crowded sports ground, or from an aeroplane. It may be pointed directly upward or directly down, or the camera can be inverted for taking reverse action pictures. Separate film reservoirs are used, and a new film can be placed in the camera in 10 seconds.

Almost any focus lens can be fitted, and the method of changing lenses is simple and expeditious. Each lens in its mount carries its own focussing scale.

SPECIFICATION

ITS CONSTRUCTION The "N.S." Auto Kine' Camera is made entirely of metal, Duralumin being used. The box-like shape makes it a very convenient instrument to handle and carry.

THE FILM BOX This box is made of Duralumin. It is rectangular in form, without projecting mechanism. It holds 200 ft. of film, and into the same box the film is automatically wound after exposure. At any time the box can be removed from the camera in daylight and another box of film inserted in its place in from 10 to 15 seconds.

THE FINDER AND LEVEL The Finder is self-contained, and is viewed by looking through the instrument. It shows a brilliant image the right way up and the right way round. The spirit level and the film measuring index are seen clearly in the lower part of the finder so that the operator knows if the camera is level and the amount of film used. The finder is fitted with a parallax adjustment giving the correction for "close-ups." When additional lenses are supplied supplementary finder lenses are provided so that the finder picture is corrected although the angle of view is altered. In the case of long focus Tele-Lenses giving a narrow angle a special telescopic finder fitted to the top of the camera is advisable.

LENSES The lenses normally fitted are the 2 in. (50 mm.) F/1.9 or F/3.5 Ross "Xpres" Lenses, and extra lenses can be supplied to any focus mounted on "N.S." Focussing Mounts. These mounts can be expeditiously removed from the camera, and are perfectly light tight.

THE MECHANISM The camera is driven by two springs, both of which are wound to the full at starting, but either spring can be wound at any time, even when the camera is in action or running. **Absolutely silent ratches are employed,** so that no attention is drawn to the camera whilst winding.

A regulator permits the film to be driven at any desired rate from 10 to 24 frames a second, and provided the camera is loaded with fresh and properly perforated film, it will drive almost 200 ft. with one wind of the mechanism. The camera is provided with a punch to record the end of a picture and this is situated at the front of the instrument. The gate is designed to eliminate scratching or "static" markings and holds the film rigid while each picture is taken. It is easily removed when cleaning is necessary. The camera is loaded in a few seconds. There is no threading up.

SUPPLEMENTARY FITTINGS FOR SPECIAL WORK

A Reflex Focussing Finder can be had which magnifies the image, and by its use close-up pictures and those given with Telephoto Lenses can be correctly focussed. For scientific work, extension tubes can be supplied so that full-sized or enlarged images may be obtained. Special means for releasing the camera from a distance, apparatus for delayed action, and focussing apparatus, to be used in almost any position, can be added. Means for focussing and setting the iris from the back of the camera can be supplied, and these can be operated, if desired, when the camera is in action. The camera may be used on an ordinary tripod, its automatic action leaving the operator with both hands free.



THE "N.S." AUTO KINE' CAMERA—Regular Model—*cont.*

SPECIFICATION—*continued.*

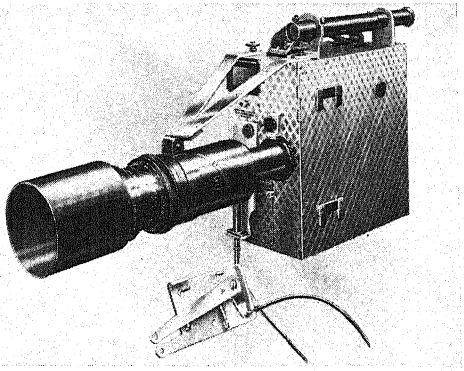
Captain Roger Hilsman, United States Army, writes from Manila:

"You may refer anyone to me regarding the Auto Kine' Camera and it will be my pleasure to recommend it above all makes of clockwork-driven motion picture cameras. You have in me a living advertisement for your excellent product."

From BRITISH INSTRUCTIONAL FILMS LTD., Welwyn Garden City, Herts:

"You will be interested to get a report on the two clockwork cameras supplied. These proved an unqualified success. They never jammed and the pictures taken with them are rock steady.

With regard to the distant release fittings, we found these of the utmost use. Dangerous animals can be allowed to walk right up to the camera, which was hardly advisable with a camera which had to be cranked by hand. Under the very roughest conditions they never gave us a moment's anxiety."



The "N.S." Auto Kine' Camera fitted with 17 in. Telephoto Lens, special Telescopic Finder and Court-Treatt Starting and Stopping Device.

Yours faithfully,
For and on behalf of
BRITISH INSTRUCTIONAL FILMS LTD.,
(Signed) C. COURT-TREATT.

NET CASH PRICES in LONDON of the "N.S." AUTO KINE' CAMERA and ACCESSORIES

(REGULAR MODEL)

Size, $9\frac{1}{2} \times 4\frac{3}{4} \times 9\frac{1}{2}$ in. (24 × 12 × 24 cm.)
Weight, 17 lbs. (7.8 kilos.)

	Net Cash Prices £ s. d.	Code Word
"N.S." Auto Kine' Camera, complete with film box as described and 2 in. (50 mm.) F/3.5 Ross "Xpres" Lens	120 0 0	SPEEDED
Ditto, with $1\frac{1}{2}$ in. (37 mm.) F/3.5 Ross "Special Xpres" Lens	120 0 0	SPEDIEREN
Ditto, with 2 in. (50 mm.) F/2.9 Dallmeyer "Pentac" Lens	122 5 0	SPEDITIVO
Ditto, with 2 in. (50 mm.) F/1.9 Ross "Xpres" Lens	124 10 0	SPEECHFUL
Best Hand-Sewn Solid Leather Case with lock and key and sling strap	5 0 0	SPEEDING
Extra Film Boxes for 200 ft. 35 mm. film each	8 10 0	SPEEDWELL

SINCLAIR LONDON

THE "N.S." AUTO KINE' CAMERA—Regular Model—*cont.*

	Net Cash Prices £ s. d.	Code Word
Best Hand-Sewn Solid Leather Case for two extra film boxes and extra lenses	4 10 0	SPEELGOED
Filter Holder for front of lens mount, to take 2 inch square filters	2 2 0	SPELTVELD
"K" or "X" Filters for above	0 10 0	
Extra Cost of Reflex Focussing Device, if ordered with camera	10 0 0	SPEEKJES
Devices for focussing, and altering Iris Diaphragm from back of the Camera; with Filter Holder	15 0 0	SPEILOCH
Distance Starting and Stopping Device	8 10 0	SPEIDEL
"N.S." Kine' Tripod with Revolving Top only	33 0 0	SPELFONT
"N.S." Kine' Tripod with Universal Revolving and Tilting Top	55 0 0	SPELLFUL
Set of two Cases for Kine' Tripod and Top ...	4 10 0	SPELLASSI
"N.S." Unipod (page 467)	1 15 0	STABILIFY

SUPPLEMENTARY LENSES

The price in each case includes the "N.S." Special Focussing Mount, Hood for Lens where necessary, and Finder Correcting Lens in frame fitting, for placing at the front of the regular finder lens, so that the view given by the finder will coincide with that given when using the supplementary lens. In the case of lenses longer in focus than 9 in. this finder lens is not supplied, but sighting pointers are fixed on the camera, and the Reflex Device for accurate focussing on near distances is recommended.

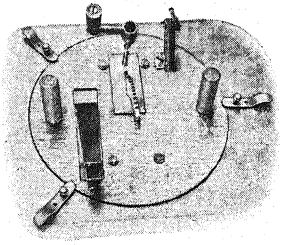
	Net Cash Prices £ s. d.	Code Word
1¼-in. F/1.9 Ross "Xpres" Lens and fittings as described	14 10 0	SPEELBORD
1¼-in. F/3.5 Ross "Special Xpres" and fittings as described	10 10 0	SPEELHOL
2-in. F/1.9 Ross "Xpres" Lens and fittings as described	15 0 0	SPEGNENDO
2-in. F/3.5 Ross "Xpres" Lens and fittings as described	10 10 0	SPEGNIATE
3-in. F/1.9 Ross "Xpres" Lens and fittings as described	17 0 0	SPELTLAND
3-in. F/3.5 Ross "Xpres" Lens and fittings as described	11 10 0	SPEELKAS
4-in. F/3.5 Ross "Xpres" Lens and fittings as described	13 0 0	SPEELMAN
6-in. F/4.5 Ross "Xpres" Lens and fittings as described	14 10 0	SPEICHEN
6½-in. F/5.5 Ross "Teleros" Lens and fittings as described	14 0 0	SPEELNOOT
9-in. F/5.5 Ross "Teleros" Lens and fittings as described	17 10 0	SPEIREES
11-in. F/5.5 Ross "Teleros" Lens and fittings as described	20 0 0	SPIESEN
13-in. F/6.3 Ross "Teleros" Lens and fittings as described	20 10 0	SPEKMES
17-in. F/6.3 Ross "Teleros" Lens and fittings as described	30 0 0	SPEKMUIS
17-in. F/5.5 Ross "Teleros" Lens with special fittings and telescopic finder	50 0 0	SPEKNEK
2-in. F/2.9 Dallmeyer "Pentac" Lens and fittings as described	12 15 0	SPEELSCH
6-in. F/3.5 Dallmeyer "Dallon" Lens and fittings as described	19 0 0	SPEERHAI



"N.S." AUTO KINE' CAMERA

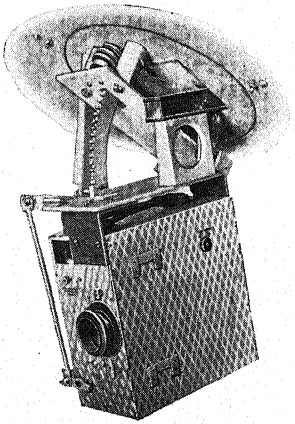
IS
UNSURPASSED
FOR
AERIAL WORK

IT IS USED BY THE
ROYAL AIR FORCE



Revolving turntable in floor of Aeroplane

THREE OF THESE
CAMERAS WERE USED
BY MESSRS. GAUMONT
FOR THEIR FILM
OF THE HOUSTON
EVEREST FLIGHT



Underside of Aeroplane showing Camera

These illustrations show the value of our mechanical drive for aeroplane work. The two handles, in the upper illustration, serve to rotate the Camera fixed under the Turntable, and to lift it into the plane in order to insert a fresh film.

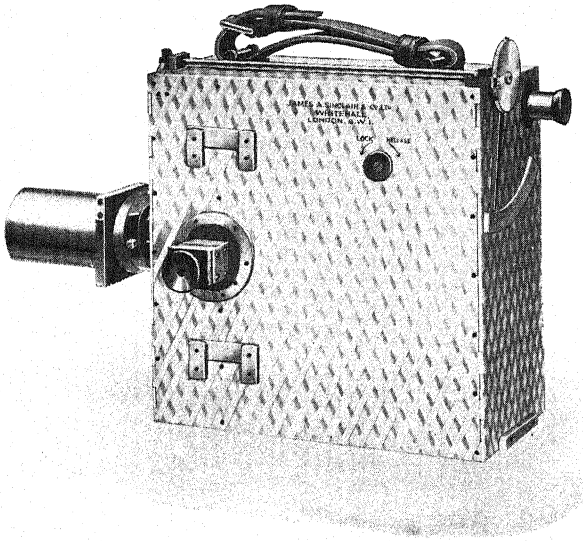
SINCLAIR LONDON

"N.S."

AUTO KINE' CAMERA

STUDIO MODEL

THIS IS THE AUTOMATIC CAMERA DE LUXE AND HAS ALL THE REFINEMENTS REQUIRED BY THE MOST EXACTING WORKERS



The "N.S." Auto Kine' Camera with rear focussing and iris controls, Reflex finder, Filter holder and Lens Hood.

IT DRIVES NEARLY 200 FT. 35 MM. FILM WITH ONE WIND OF THE MECHANISM.

IT HAS FOCUSSING AND IRIS CONTROLS ARRANGED TO WORK AT THE BACK OF THE CAMERA AND THEY CAN BE USED WHILE THE INSTRUMENT IS RUNNING.

IT CAN BE USED FOR " FADE IN " AND " FADE OUT " EFFECTS.

SINCLAIR LONDON

THE "N.S." AUTO KINE' CAMERA

STUDIO MODEL—*continued*

IT CAN BE USED FOR "MIXES."

IT HAS A "ONE TURN ONE PICTURE" HANDLE.

IT HAS A FINDER ADJUSTABLE FOR PARALLAX.

IT CAN BE RUN AT SPEEDS VARYING FROM 10 TO 24 FRAMES A SECOND.

IT HAS A FILTER HOLDER INTO WHICH FILTERS CAN BE INSERTED AND QUICKLY CHANGED.

IT HAS A REFLEX FOCUSSING DEVICE PERMITTING OF ACCURATE FOCUSSING WHEN TAKING "CLOSE UPS" OR WHEN USING LONG FOCUS LENSES.

This model is in appearance and general construction very similar to our Regular Model but embodies all the additions that have been fitted from time to time. The measurements of the camera body and boxes are the same as those of the Regular instrument, but the boxes differ in construction so that the film may be reversed in them. It drives 180 feet with one wind of the mechanism.

Extra lenses and their fitments cost the same price as those listed for the Regular Model, but the special focussing and iris controls from the back of the camera are not fitted to these extra lenses.

	Net Cash Prices			Code Word
	£	s.	d.	
Price of Studio Model with F/1.9 Ross "Xpres" Lens	199	10	0	SPEKTRUM
Extra Film Boxes .. .. each	8	10	0	SPELATORE
2 in. square "K" or "X" Filters, each	0	10	0	
Hand-sewn Solid Leather Case to hold camera as above	5	0	0	SPELAZZO
"N.S." Unipod (page 467) ..	1	15	0	STABILIFY
"N.S." Tripod Stand with Universal control for Panoram, and Tilting Top	55	0	0	SPELLFUL

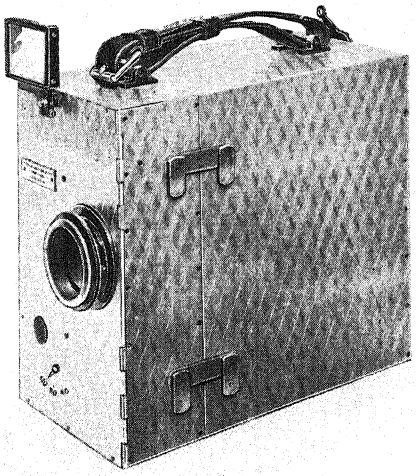


"N.S."

AUTO KINE' CAMERA

SLOW MOTION MODEL

THE FIRST
AND ONLY
CLOCKWORK
DRIVEN
CAMERA
FOR
SLOW
MOTION
WORK.



IT REQUIRES NO TRIPOD
NO WINCH HANDLE
NO FLEXIBLE DRIVE
NO MOTOR
NO ACCUMULATOR
NO HARD WORK

IT HAS VARIABLE SPEED 40 to 120 FRAMES A SECOND.

IT HOLDS 100 FEET 35 mm. FILM, ALL DRIVEN WITH ONE WIND OF THE MECHANISM.

IT PASSES ONLY 18 INCHES FILM BEFORE FULL RATE IS OBTAINED.

IT CAN BE STOPPED AND RE-STARTED with a loss of only two feet of under-speeded film.

SINCLAIR LONDON

THE "N.S." AUTO KINE' CAMERA

SLOW MOTION MODEL—*continued*

In general appearance this camera is very similar to our Regular and Professional Models, but somewhat smaller. It is only intended for the special work of analysing the sequence of motion. Pictures taken at a high rate of speed and shown at the normal rate have a great fascination for any observer, quite apart from their scientific value in deciding what actually takes place in a movement that is not seen by the eye. Hitherto cameras for this work have been exceedingly heavy and very costly. Driving the mechanism is generally a toil, and a great quantity of film is wasted before the instruments attain their indicated speed. In the "N.S." Camera the difficulties hitherto characteristic of this work have been surmounted. The camera is light and does not need a tripod. No laborious work is necessary. The mechanism is wound up and only requires a slight pressure on the camera release to set the film running at the rate decided upon, and there is no heavy loss of film when starting up.

Size, 10 × 5 × 8½ in.
Weight, 19 lbs.

	Net Cash Prices £ s. d.	Code Word
"N.S." Slow Motion Auto Kine' Camera with 2 in. F/1.9 Ross "Xpres" Lens	170 0 0	SPERNES
Hand-sewn Solid Leather Case with lock and key and sling strap ..	4 15 0	SPERNIMUS
Extra Film Boxes for 100 ft. 35 mm. film	8 10 0	SPERNETIS
"N.S." Unipod (see page 467) ..	1 15 0	STABILIFY
"N.S." Kine' Tripod with Universal control to Panoram and Tilting Top	55 0 0	SPELLFUL



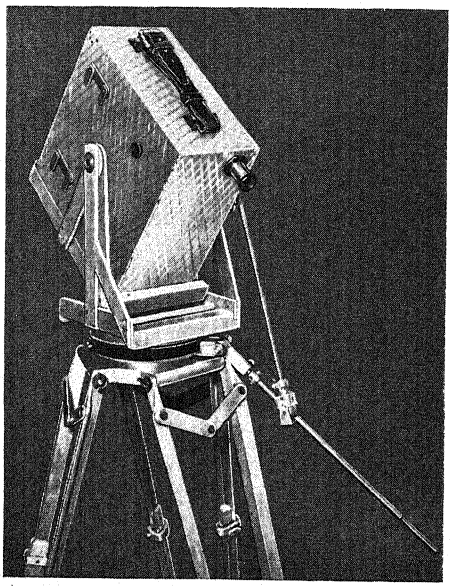
"N.S."

KINE' TRIPODS

THEY ARE THE BEST IN THE WORLD

THEY COMBINE LIGHTNESS WITH RIGIDITY

MARVELLOUS RANGE OF MOVEMENT



This stand is made entirely of metal, and although weighing only 19 lbs. is the strongest and steadiest stand yet produced. The elevating head is made in two forms, Type I being for the "N.S." Auto Kine' Camera and Type II for the "N.S." Standard Kine' Camera and which can be fitted to most other cameras.

The novel feature of both types is the method by which the weight of the camera is kept in the centre of the tripod, no matter at what angle the camera is tilted. Type I, as used for the "N.S." Auto Kine' Camera, allows the camera to revolve on its axis so that it can be used pointing directly upwards, or the camera may be inverted for trick work. Type II, as used for other cameras, is illustrated on page 480. This can be lifted or depressed to an angle of 40° from the horizontal. **The lever arm controls all the movements, so that with both types the cameras can be made to traverse either in a vertical, horizontal or diagonal direction.** The start of the movement in either direction is absolutely without jerk, and can be arrested immediately. The mechanism contains no gearing of any kind, is of great simplicity, and not liable to derangement.

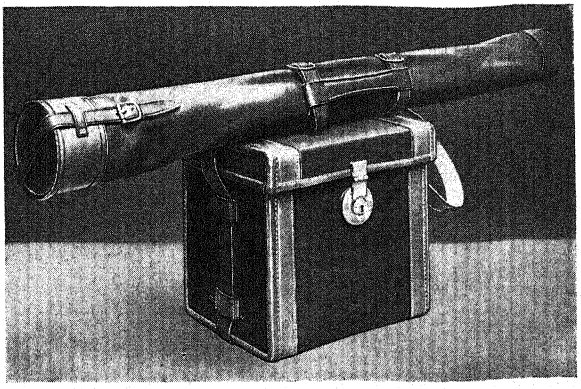
SINCLAIR LONDON

"N.S." AUTO KINE' TRIPOD—*continued*

The legs are quickly detachable for transport and can be fixed instantly.

The height can be altered with great facility, the legs sliding very freely, and the changing being easy and certain. A special fixing is provided for our Auto Camera which allows it to be affixed or detached in two seconds.

	Net Cash Prices £ s. d.	Code Word
The Stand complete with revolving and tilting top, Type I, for "N.S." Auto Kine' Camera (Page 478) ..	55 0 0	SPELLFUL
Ditto, Type II, for " N.S." Standard Kine' and other makes (Page 480)	55 0 0	SPELONCA
The Stand with revolving top only weighing 12 lbs. 10 ozs., costs ..	33 0 0	SPELFONT



For transit we recommend our Mail Canvas Cases. These are strengthened with leather binding. Two cases are supplied, one holding the Tripod Legs and the other the Revolving and Tilting Tops. The weight of Tripod, complete with the two cases, is 26 lbs. (12 kilos).

	Price £ s. d.	Code Word
Price of the Two Cases	4 10 0	SPELLASSI

SINCLAIR LONDON

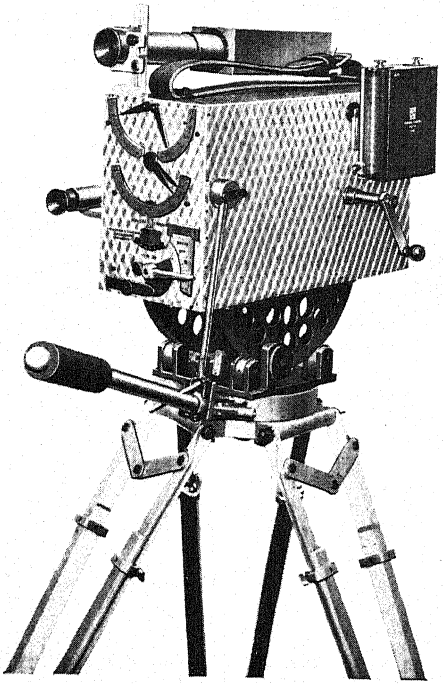
"N.S."

No. 4 STANDARD

KINE' CAMERA

with HAND and ELECTRIC DRIVE

(NEWMAN & SINCLAIR'S PATENTS)

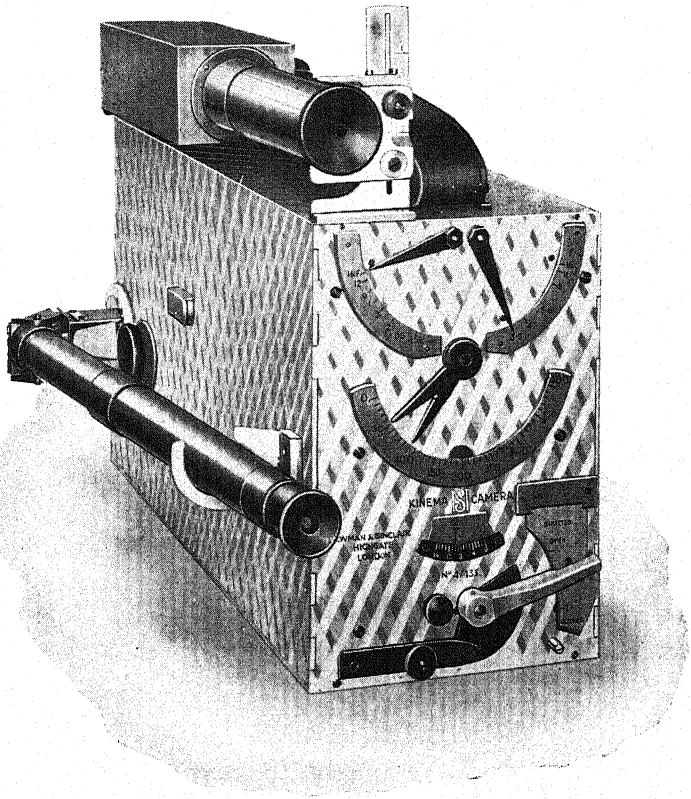


THIS CAMERA CAN BE SUPPLIED FOR USE WITH ORDINARY ELECTRIC SUPPLY

" N.S." No. 4 Standard Kine' Camera with motor, on " N.S." Kine' Tripod with Revolving and Tilting Top.

SINCLAIR LONDON

THE "N.S." STANDARD KINE' CAMERA—*continued.*



Supplied amongst others to :—

H.M. WAR DEPARTMENT
NEW ZEALAND GOVERNMENT
MESSRS. MARCONI
MESSRS. GAUMONT-BRITISH PICTURE CORPORATION LTD.
THE ROYAL GEOGRAPHICAL SOCIETY
THE LATE MR. HERBERT G. PONTING, F.R.G.S.
THE METROPOLITAN MUSEUM OF ART, NEW YORK
THE NEW YORK ZOOLOGICAL SOCIETY
MAJOR RADCLYFFE DUGMORE and
MR. CHERRY KEARTON

SINCLAIR LONDON

THE "N.S." STANDARD KINE' CAMERA—*continued.*

- 25 YEARS AGO THE "N.S." KINE' CAMERA WAS ADVERTISED IN THE B. J. ALMANAC. It had been selected for the Antarctic Expedition led by that gallant explorer, Captain Scott, R.N., and was used by Mr. Herbert Ponting, F.R.G.S., for most of his natural history work on that heroic adventure. These great figures have passed but, the "N.S." Kine' Camera which has embodied all the modern improvements due to Mr. Arthur S. Newman's inventive capacity, is still unrivalled for Scientific and Topical work.
- It can be driven by Hand or Electric Motor.
- It can be driven forwards or backwards without changing either belts or pulleys.
- It is easy when reversing to return to any special "frame" in the whole of the 400 feet of film and is unsurpassed for "effect"-studies.

SPECIFICATION

Camera built entirely of metal, all parts being milled out of the solid, no castings being used. The metal is almost as light as aluminium, but is free from that metal's instability, and in its general characteristics and properties for standing shocks and strains, resembles mild steel. Being light in colour, it reflects heat, and is therefore particularly adapted for tropical climates.

All works easily visible when the doors are opened, and every part accessible for cleaning.

Reversing Action by merely turning the handle backwards. No bands to be shifted.

Square Film Boxes (holding 400 ft.), entirely without projections which automatically gear when placed in the camera. The absence of projections and the square form make them the most convenient for packing and transport. These boxes are provided with mouths which automatically open when closing the camera, and they entirely obviate electrical markings or "static."

Film Counter. This is at the back of the camera, and shows the amount of exposed film in the camera, and the length to a single picture determined at any moment. Each individual picture is recorded, and can be returned to after exposing any length of film.



THE "N.S." STANDARD KINE' CAMERA—*continued.*

Focussing can be accomplished by three methods. Firstly, by a reflex focussing arrangement which carries a magnifying eye-piece or periscope on the side of the camera. Secondly, by an accurate scale focussing seen from the back of the camera. Thirdly, by a prism eye-piece for magnifying the image through the film itself.

Iris worked from the back of the Camera, by the movement of a lever, accurately scaled. The same scale may be adjusted to automatically work with both 2 and 3 in. lenses, without alteration.

Lenses interchangeable on interchangeable fittings, which can be attached or detached with one hand only.

Single picture handle always in position.

Brilliant Finder. Each camera is supplied with a brilliant finder, which is quickly attached or removed from the top of the camera, and this finder is without parallax, and is provided with a scale for accurately setting its frame for close-up work.

Lever Shutter Fade. The shutter is nearly 180° when open and this shutter is controlled by a lever at the back of the camera. Depressing this lever closes the shutter, and when the shutter is quite closed a catch holds the lever in position, the mechanism at the same moment is stopped by a brake. A second catch is provided which, while retaining the shutter in the closed position, allows the mechanism to run freely, so that in "mixes" the film can be worked backwards to the desired amount without exposing it. The opening of the shutter can thus be controlled from the back of the camera. A scale is provided which shows the amount of opening and the setting can be fixed by turning a milled knob. The camera is provided with a clamping, non-scratching gate; the film is quite free during its movements and is guided in such a way that neither the back nor the front of the film touches any part except the edges. It is automatically dropped upon a pilot pin and a clamp holds it flat during exposure. The complete gate is easily removed for cleaning.

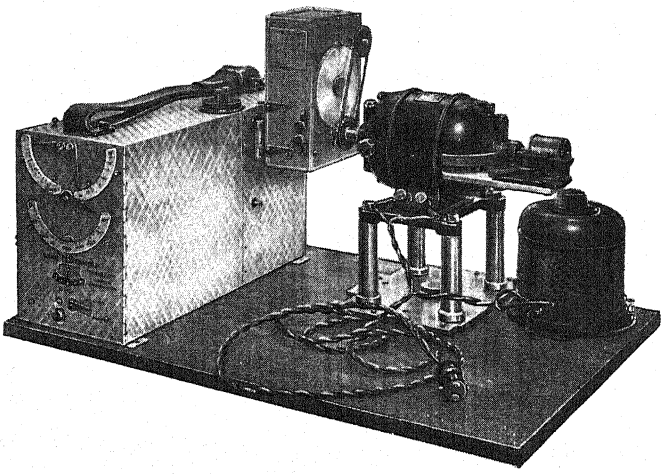
SUPPLEMENTARY FITTINGS

The "N.S." Automatic Electric Drive. Owing to the extraordinary ease with which the "N.S." Kine' Camera runs, we are able to drive it with a small motor that only weighs 3½ lbs. The power for the motor is obtained either from any ordinary electric supply, or from a battery which, with its containing box, weighs 18 lbs. and will drive 4,000 ft. without recharging. When the camera is used with the ordinary electric supply, a Transformer and Rectifier, both light and portable, are then sent with the outfit. For those who require it, we also provide a **Relay Instrument** complete in box, by means of which the camera can be started and stopped at any distance up to 100 yards, and longer distance relays can be made to order. Full particulars will be found in our Kine' Camera Catalogue.

The "N.S." Vignetting and Dissolving Apparatus. This apparatus consists of a bellows fitting carrying at the front our improved "N.S." Iris Attachment and Adjustable Card Carrier. This iris can be set to vignette any portion of the picture, and is so constructed that it gradually and **entirely** closes and it can also be set to open or close to any definite point. The front card holder enables a roller blind or curtain effect to be produced. A second attachment forms a complete vignetting device, which enables squares, rectangles, ovals or blind effects to be produced at any part of the picture.

SINCLAIR LONDON

THE "N.S." STANDARD KINE' CAMERA—*continued.*



The "N.S." Standard Kine' Camera as supplied to Cambridge Zoological Laboratory, taking pictures at speeds from 10 to 40 per second and with geared control to take pictures at intervals of 1, 2, 4, 8, 16 and 32 seconds, for use with mains current.

The "N.S." Camera is the easiest camera to thread, using a minimum quantity of film and can be threaded as easily backwards as forwards. **It is the lightest running camera ever made.**

Size of Camera with 2 film boxes, 14 × 5¾ × 8 in. (355 × 146 × 204 mm.). Weight, 18 lbs. 5 oz. (8.3 kilos.).

NETT CASH PRICES IN LONDON

	Price £ s. d.	Code Word
No. 4, "N.S." Standard Kine' Camera, as described, with 2 in. F/3.5 Ross "Xpres" Lens, complete with 2 film boxes, "N.S." brilliant finder, and reflex focussing finder with periscopic tube attachment, fade out to shutter	**250 0 0**	SPARGEL
Ditto, with electric motor and battery	**287 10 0**	SPARGOUTE
Ditto, with electric motor, Transformer and Rectifier for use with ordinary electric supply. State voltage when ordering and if A.C. or D.C.	**237 10 0**	SPARHAFEN

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THE "N.S." STANDARD KINE' CAMERA—*continued.*

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Relay Instrument complete in box, for driving camera at any distance up to 100 yards ...	20 0 0	SPAIANDO
"N.S." Geared Mechanism for automatically taking slowly moving objects. Taking single pictures in 1, 2, 4, 8 or 12 seconds	20 0 0	SPAIATE
"N.S." Vignetting and Dissolving Apparatus, with attachments for every kind of studio dissolving and fade effects	25 0 0	SPARIMENTO
Best Hand-Sewn Solid Leather Case to hold No. 4 Kine' Camera and finders	6 15 0	SPADDLE
Supplementary Lenses with Control adjustments for focussing and altering diaphragms from back of the camera :		
1½in. (37 mm.) F/3.5 Ross "Xpres" Lens ...	15 10 0	SPANADER
1½in. (37 mm.) F/1.9 Ross "Xpres" Lens ...	18 10 0	SPENTA
2 in. (50 mm.) F/1.9 Ross "Xpres" Lens ...	19 0 0	SPEOTHES
3 in. (75 mm.) F/1.9 Ross "Xpres" Lens ...	21 0 0	SPERBOOM
3 in. (75 mm.) F/3.5 Ross "Xpres" Lens ...	15 10 0	SPADONIES
Supplementary Lenses in "N.S." Special Helical Focussing Mounts, Hoods and Finder Masks :		
4 in. F/3.5 Ross "Xpres" Lens	15 0 0	SPANIOPES
5⅛in. F/3.5 Ross "Xpres" Lens	17 10 0	SPANKALB

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For full list of Lenses and other fittings see Kine' Catalogue.



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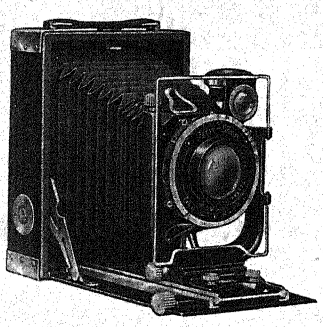
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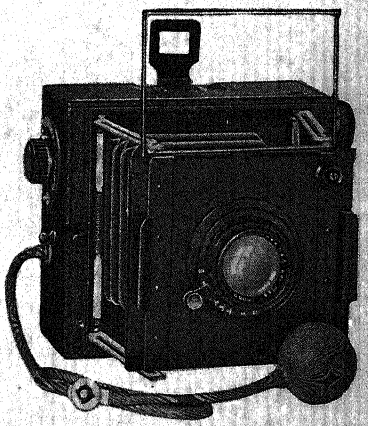
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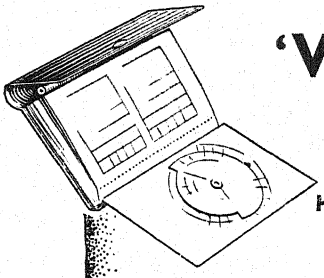
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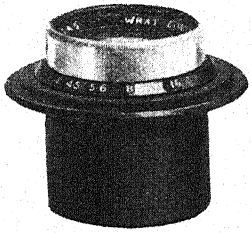
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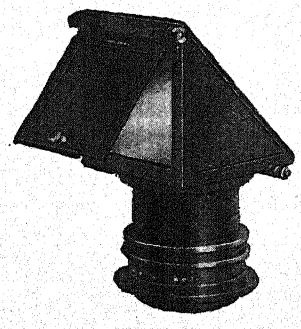


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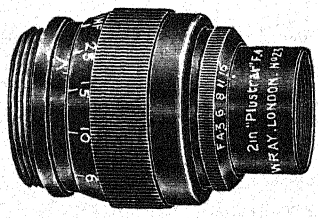
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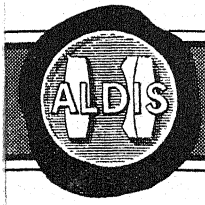
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5A & 6	5½ & 6	4¼ × 3¼	1½	0	2 10 0	3 15 0	—
7	7½	6½ × 4¾	1½	1	3 0 0	4 5 0	—
8	9	8 × 5	1¾	2	4 0 0	5 5 0	—
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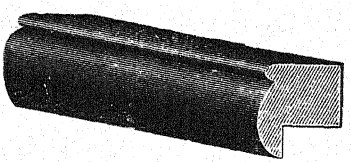
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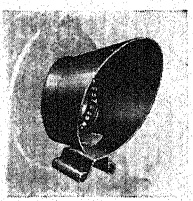
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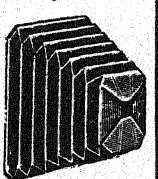
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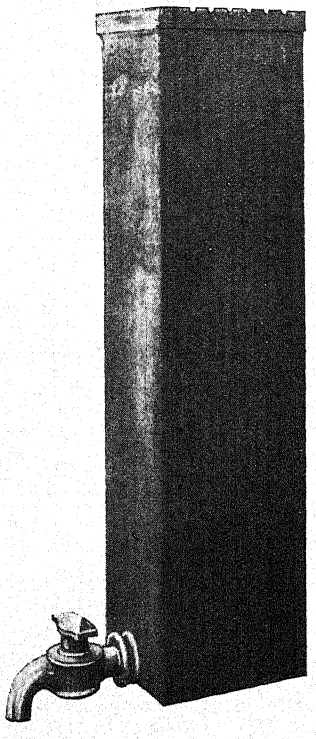
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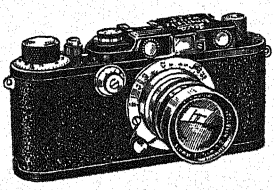
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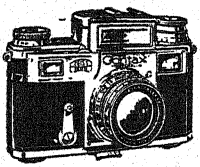
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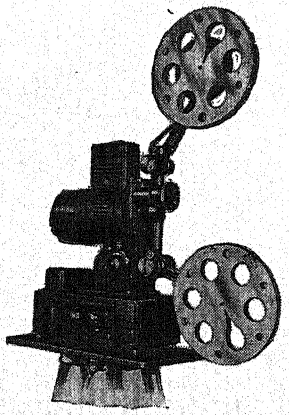
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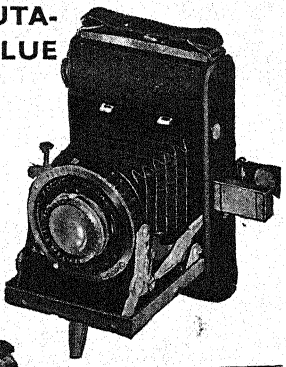
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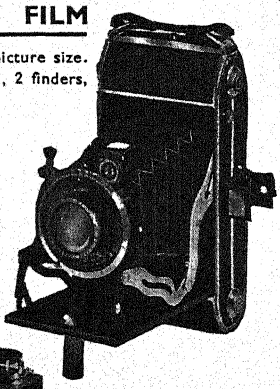
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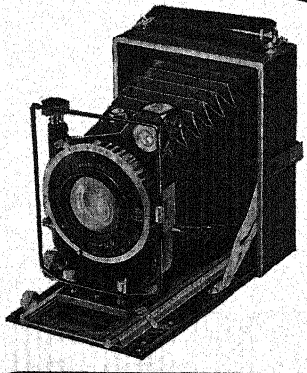


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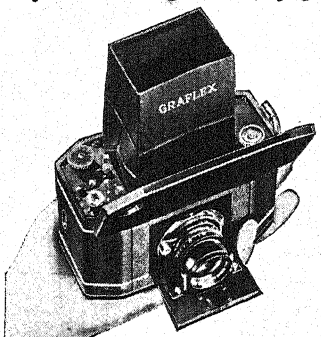
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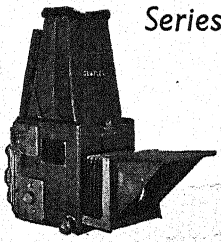
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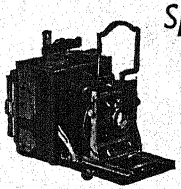
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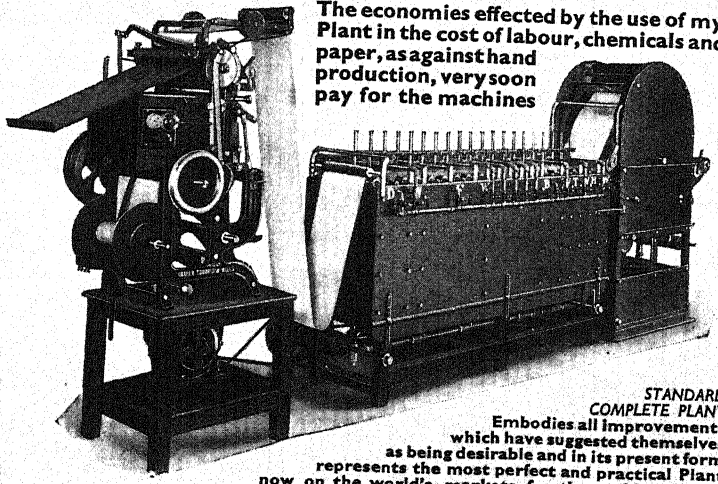
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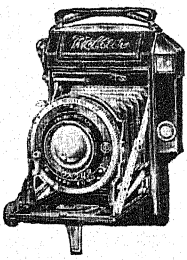
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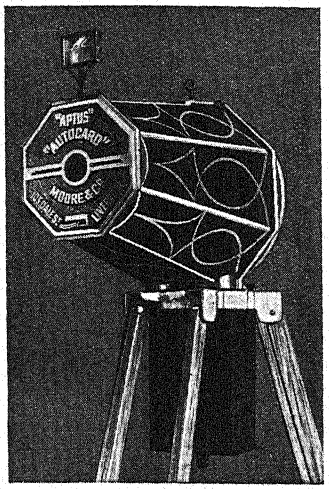
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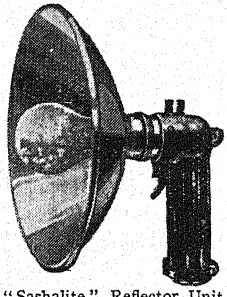
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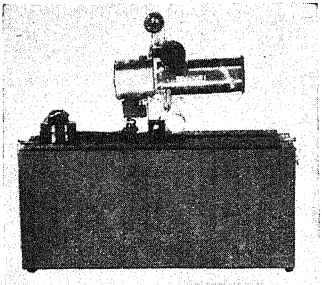
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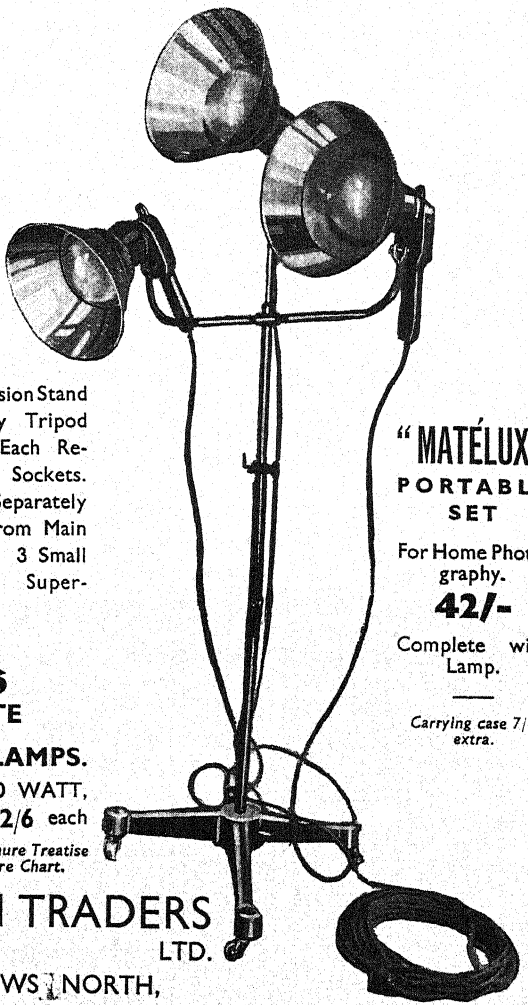
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Cinea Semi-automatic Splicer only **£2 10 0,** supplied for 16, 9·5 or 8 mm.

Splicer on base with rewinds, **£4 4 0.**

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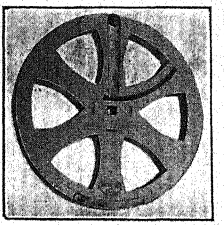
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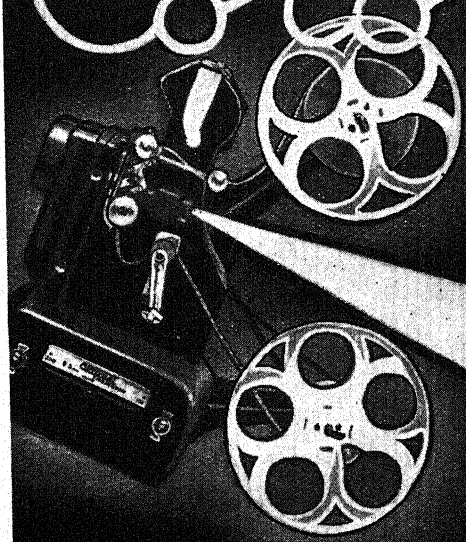
fits Siemens Standard Projector. Uses 35 mm. film instead of heavy glass slides. Bobbins carry 100 ft. of film. Where necessary 2" × 2" glass slides can be used. Price **£7 15 0.**

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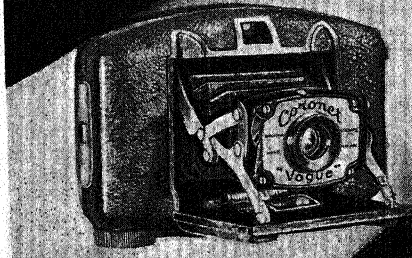
Cinepro accessory catalogue and details of the range of Siemens Cameras and projectors. Have you seen the new 16/9 Projector—takes both 16 and 9.5 films and uses the Siemens patent take-up on both sizes, gladly sent on request.

Coronet



The two models illustrated on this page are entirely new productions. The new CORONET Projector embodies every feature which Cinematograph enthusiasts have been waiting for—at an extremely modest price.

The Projector is sprocket driven, self-contained, fitted 1" Anastigmat projection lens, and is suitable for all voltages 100 - 250, A.C. or D.C. Hand driven model 5 Guineas. Motor unit which fits into base 45/-



The CORONET Vogue Camera is new—different —streamlined. Brown bakelite, fitted Meniscus f.10 lens, Instantaneous and Bulb exposure, brilliant direct viewfinder, etc. Takes pictures size 50 × 30mm. - Price 12/6

throw the SPOTLIGHT on cameras

CORONET also manufacture a complete range of Cameras, both Box and Folding, at prices ranging from 3/11 to 10/6 for Box models, and from 18/6 to 48/- for the folding types. There is a Camera to suit every taste. For the Cine enthusiast, the CORONET Cine Camera is ideal. Fitted Anastigmat f.3.9 lens set to an exactitude of ·00075 inch; clockwork motor; brilliant direct viewfinder; film footage indicator, etc., it takes 30 ft. lengths of 9·5mm film, and is sold at the low price of 75/-.

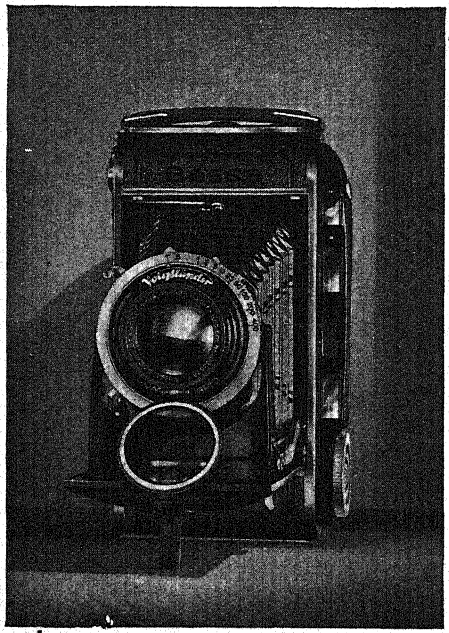


If you are interested in CORONET products, we shall be only too delighted to send you our complete illustrated catalogue on receipt of your application.

CORONET Cameras are obtainable from all good Photographic Dealers in the United Kingdom, and in almost every important City abroad.

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Telephone: Aston Cross 5804.
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VOIGTLANDER

One of the *Voigtländer* models that are establishing new conventions among cameras

THE 1937

Voigtländer

RANGEFINDER BESSA

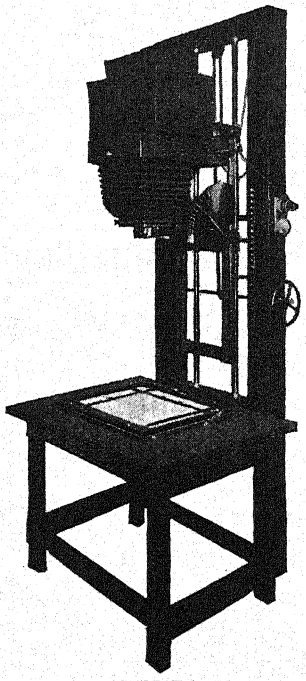
Not until Voigtlander introduced this model was it possible to obtain a camera with so many distinctive features and of such unique design for so moderate a price. With a rangefinder of optical perfection, milled-wheel focussing with engraved distances and hyperfocal chart, F/3.5 Voigtlander Anastigmat lens and several other refinements, it is typical of the value and quality-construction that the name of Voigtlander has meant since 1756.

Full particulars from :

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SOUTH AFRICA » Scherag (Pty.) Ltd., P.O. Box 7539, JOHANNESBURG.
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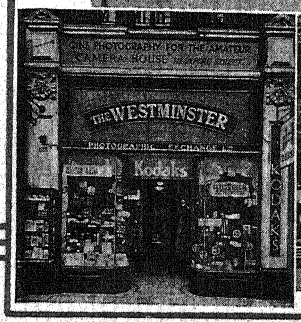
81 Strand, W.C.2. *Side Windows.*

81 Strand, W.C.2. *Front Entrance*



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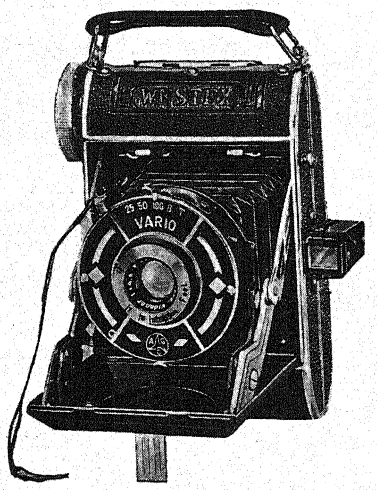
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THE **WESTMINSTER** PHOTOGRAPHIC EXCHANGE Ltd

81 Strand, W.C.2



The Famous "WESTEX" Roll Film Cameras:

The "WESTEX" MINIATURE

The "Westex" Miniature is, in every way, a High Precision Camera, capable of giving most satisfying results. The size of picture is 3 × 4 cm., 16 exposures of this size being given on the standard "Vest-Pocket" spool. With its 2.9 Radionar anastigmat, the "Westex" Miniature can be used with confidence even in dull winter lighting, and its Prontor II "delayed action" Shutter gives speeds from 1 to 1/175th, as well as Time, and Brief Time. The camera opens to "instantly ready" at a touch, and there is a particularly clear direct vision optical finder.

£5 12 6

9 *monthly payments of* 13s. 2d.

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£3 12 6

9 *monthly payments of* 8s. 7d.

● Sent on approval anywhere in Gt. Britain for seven days against cash deposit of value.

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Usually in stock:

The Full Range of LEICAS and Accessories.

ZEISS-IKON CONTAX, CONTAFLEX; the SUPER-IKONTAS, IKONTAS and other ZEISS-IKON Cameras.

ROLLEIFLEX, ROLLEICORD, FOTH and others of the Twin-lens Reflex type.

A wide range of Miniatures not already mentioned, including DOLLINA, NEW WELTUR, BALDAXETTE, MULTEX, etc.

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Twin lens "Automatic" Reflex, pictures 2¼ in. sq. 12 on normal 20 size spool. 3.5 Zeiss Tessar, special Compur Rapid to 1/500th **£25**

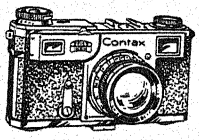
also 4×4 cm. 2.8 Tessar, £26

ZEISS-IKON IKOFLEX

Twin lens; 12 2¼ sq. on normal 8 exposure film Model I Novar 6.3 **£6 12 6**

Model II as shown, Triotar 3.8, Compur Shutter £14 15 0, *etc.*





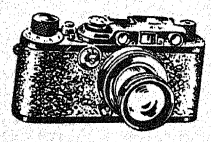
ZEISS-IKON CONTAX II

With Zeiss-Ikon wedge distance meter and finder combined, focal plane shutter to 1/1250th. Zeiss Tessar 3.5.

£40 10 0

Also with Sonnar *f* 2 *and* 1.5

CONTAX I with 3.5 *Tessar at* £31 0 0. *CONTAX III, built-in Exposure Meter and Tessar* 2.8, *from* £55 15s.

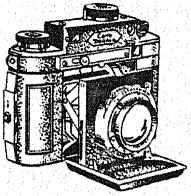


LEICA MODEL IIIA

36 exp. on 35 mm. film, coupled distance meter focal plane shutter to 1/1000th. As shown, with f2 Summar lens

£43

Others from £16 19 0

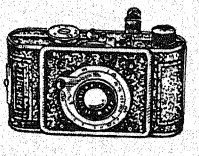


DOLLINA

Takes 35 mm. (Leica) film, 36 exposures, built-in range-finder, automatic film counting, etc. With 2.9 Radionar and Rapid Compur.

£14 12 6

Also with 2.8 *Tessar and f* 2 *Xenon.*



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Takes 16 on normal V.P. film. Focal plane shutter 1/25th-1/500th, delayed action. With 3.5 Foth anastigmat.

£5 8 6

With 2.5 *lens* £7 8 6



FOTH-FLEX

Twin lens with Foth 2.5 Anastigmat focal-plane shutter 2 to 1/500 sec.

£13 10 0

With 3.5 *lens* £10 7 6

ROLLEICORD

Rolleiflex in simpler form Automatic film counter; focusing at waist or eye-level. With Zeiss Triotar 3.5 and Compur shutter.

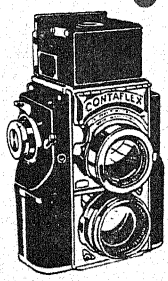
£16 10 0

With 4.5 *lens* £14 10 0



THE WESTMINSTER PHOTOGRAPHIC EXCHANGE Ltd

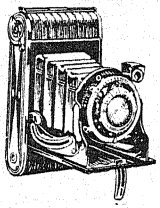
ZEISS-IKON CONTAFLEX



The world's masterpiece in cameras. A miniature reflex showing on finder screen a picture double the negative size. Albada direct vision finder for eye-level use. Focal plane shutter, ½ to 1/1000th. Built-in ultra-sensitive electric exposure meter.

With Tessar 2.8 **£64 12 6**
„ Sonnar f 2 **£71 17 6**
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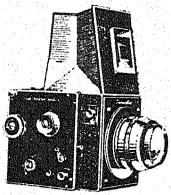
Model 0. for V.P. size pictures (1⅝ × 2½). 3.9 Solinar Anas. Compur shutter. **£5 5 0**
Also 2¼ × 3¼ 4.5 Apotar lens, etc., £6 6 0.

EXAKTA REFLEX



For V.P. size, 1⅝ × 2; focal plane shutter to 1/1000th. Adaptable to wide range of distants. 3.5 Tessar Mod. A. **£19**
Various lenses fitted.

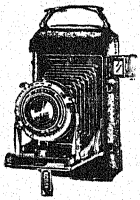
PRIMARFLEX



Reflex for 2¼ sq. (12 on normal size "20" film; film wound and counted, shutter and mirror set by one winding. 2.8 Meyer Trioplan. Also for 4½ × 6 cm. plates. **£31 10 0**

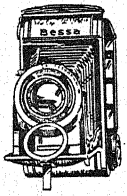
WITH BUILT-IN RANGE-FINDERS

KODAK REGENT



Streamlined body; 8 full, or 16 half-size, on usual 2¼ × 3¼ film. Zeiss Tessar 4.5 lens. Compur rapid D.A. shutter. Incl. case. **£20**

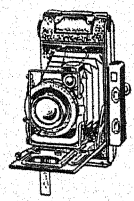
VOIGTLANDER BESSA

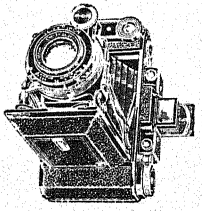


(8 or 16 exp. on 2¼ in. spool). Distance meter easily operated. Hinged yellow filter. Trigger shutter release. 3.5 Skopar lens. **£18 15 0**

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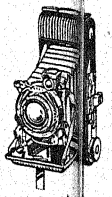




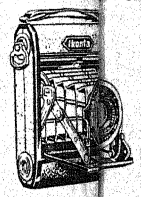
ZEISS-IKON SUPER-IKONTA

With Zeiss revolving wedge distance meter, Tessar or Triotar lenses, 4½ × 6 cm. to 4½ × 2½ sizes. Special model II (as shown). **£27**
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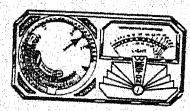
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SIXTUS £5 5 0



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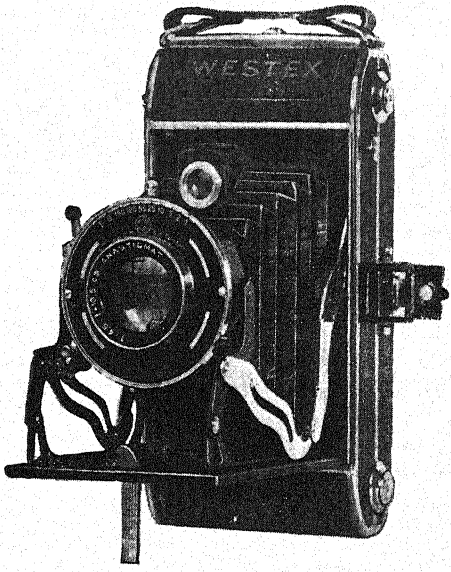
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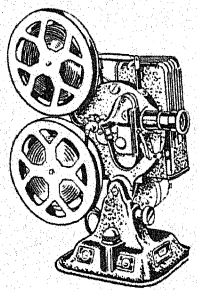
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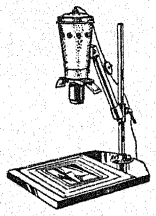
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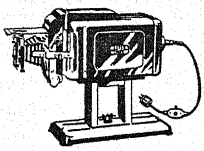
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750 watt "Prefocus" lamp; "Auditorium" Projection lens; simple threading; forward and reverse drive, high-gear motor re-wind. Pilot light. With resistance and case **£36 10 0**



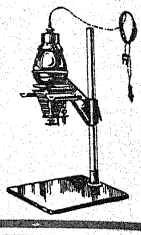
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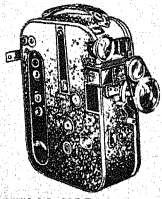


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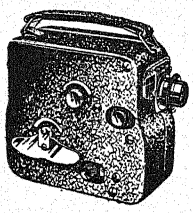


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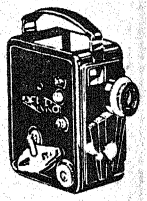


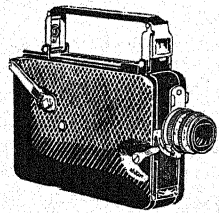


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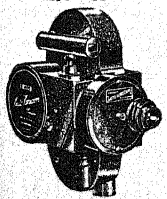




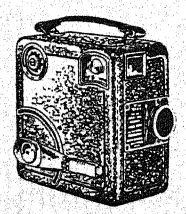
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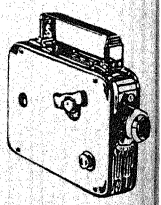
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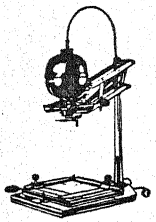


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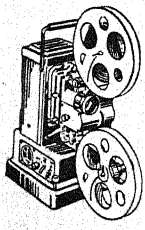
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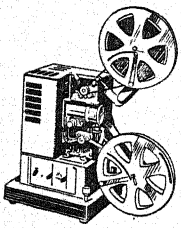
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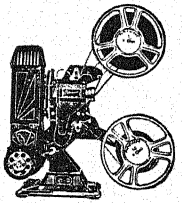
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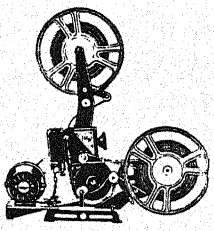




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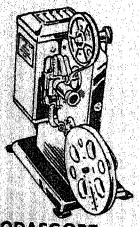


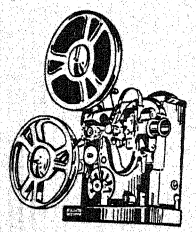
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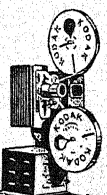
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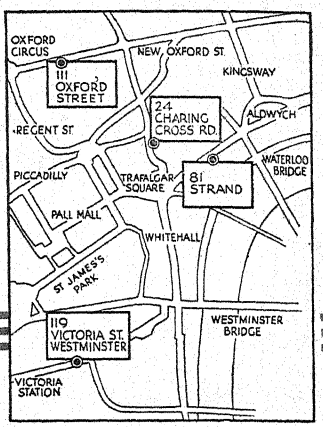
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2¼×3¼ **ZEISS-IKON MAXIMAR**; 4.5 Tessar, D.A. Compur; 3 single slides, F.P.A., case £9 17 6
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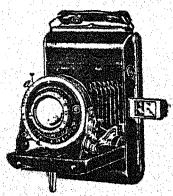
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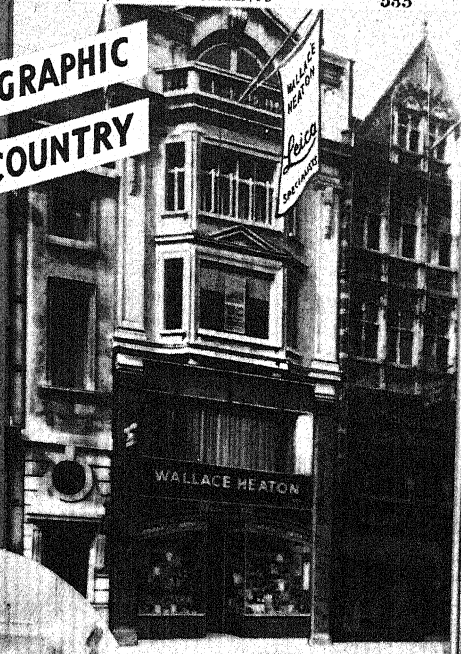
CHEMICAL MANUFACTURERS TO THE PHOTOGRAPHIC INDUSTRY

THE LARGEST RETAIL PHOTOGRAPHIC ORGANISATION IN THE COUNTRY

A CHAIN OF NINE LONDON SHOPS

127, New Bond Street, W. 1
(Head Office and Showrooms, Film Library, etc.)
47, Berkeley Street, W. 1.
45, Kensington High Street, W. 8.
1, Avery Row, W. 1 Secondhand Bargain Shop and five Branches of City Sale and Exchange (1929) Ltd. (see separate Inset.)

Also the Wallace Heaton Commercial Photographic Studios, 12, Avery Row, W. 1, and our D. & P. Factory, Master Photo Finishers, 31, Johns Mews, Bloomsbury, W.C. 2.



No. 127 New Bond Street

Part of our Ground Floor Showroom at Bond Street



A corner of our exhibition gallery



Leading LEICA SPECIALISTS FOR OVER 10 YEARS. See next page but one, for special miniature camera facilities.

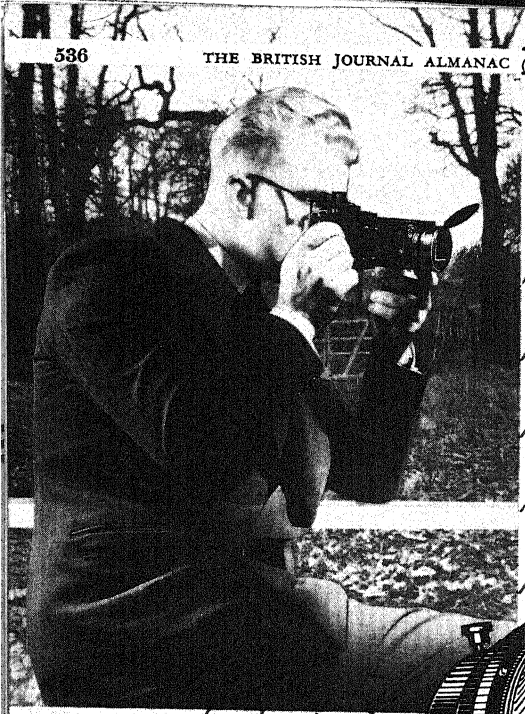
Also LEADING SPECIALISTS IN ALL MAKES OF MINIATURE CAMERAS.

HOME TALKIES, HOME MOVIES, FILM LIBRARY.

All the latest models in cine cameras and silent and sound projectors can be seen and heard in our demonstration theatre at 127, New Bond Street. Expert unbiassed advice willingly given on your choice of apparatus. Every Home Cine Accessory in stock.

WALLACE HEATON LTD.

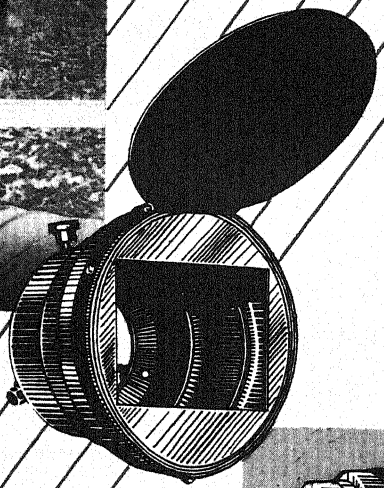
127 NEW BOND STREET, LONDON, W. 1



THE ZODEL LENS HOOD

(Patented)

PRICE - 7/6



PERFECT PICTURES ALL THE YEAR ROUND IN ANY WEATHER

For getting beautiful against-the-light pictures in the summer months—for autumn shots facing the sun at a low altitude, giving many shadow patterns and unusual effects, and during the winter, as a protection for your lens against rain and snow splashes. For really serious work the Zodel All Metal Lens Hood is indispensable. Designed in three sliding telescopic sections, and has adjustable sunshade flap which can be set to cast a shadow over the inside of the hood. In two sizes: No. 1 for lens flanges 1″ to 1¼″.

No. 2 for lens flanges 1¾″ to 2″.

Sockets for circular unmounted Filters 1¼″ or 1½″, 2/- each.

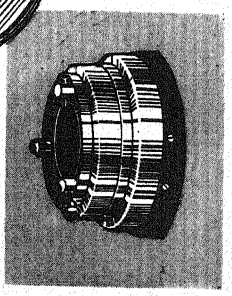


Illustration showing Zodel Lens Hood closed.

WALLACE HEATON LTD. 12

47 BERKELEY STREET, LONDON, W. 1

Commercial Photographic Studios: 1a AVERY ROW, W.1

OVER 500 LEICA ACCESSORIES ACTUALLY IN STOCK

We make a point of seeing that every Leica Accessory is always in stock—this fact alone is sufficient justification for our claim to be THE LEADING LEICA SPECIALISTS.

Our stock of other miniature cameras and their accessories is very complete. Our knowledge and experience of all miniature cameras is absolutely unequalled. Our advice is free and unbiassed.

A CUSTOMER WRITES:

RADCLIFFE.

"Received camera this morning. For a really good bargain it far exceeds my expectations; it is the finest value I have ever seen. Its condition is excellent and I do not know how you do it for the money."

F.B.



"MICROLUX" SERVICE. This service of developing in Paraphenylene-Diamine and other agents ensures the best results from your miniature films; results which have so minute a grain size that they will enlarge twenty diameters or more without the grain becoming apparent. Owing to the nature of this development it is essential that films for "MICROLUX" development receive at least twice the normal exposure. Providing this extra exposure is given, negatives possess a quality that cannot be equalled by ordinary methods. We offer this service confident in the belief that it will meet the requirements of those careful workers who would always do their own processing had they the convenience. Prices on request.

"AUTOMAX" *(Regd.)* **PRINTS.** $3\frac{1}{2}" \times 2\frac{1}{2}"$ prints made direct from Leica, Contax and other miniature negatives at 2 – per dozen. This service enables miniature camera users to get prints of appreciable size without the cost of enlarging. "Automax" prints are of the finest quality and bring out details which can scarcely be seen on an original size contact print. They are made exclusively by Wallace Heaton Ltd.

SPECIAL MINIATURE CAMERA FACILITIES. We are the only photographic firm giving free "all risks" (in Gt. Britain only) insurance on miniature cameras, value £10 or over, whether bought from us or not. We also send "Leica News" free monthly to all registered Leica owners. Free Instruction Cards for Leica users and Exposure Cards free to all miniature Camera users. Register your "MINICAMERA" with us.

We stock every book published on Leica and miniature camera photography—list of such books with description and prices sent on request.

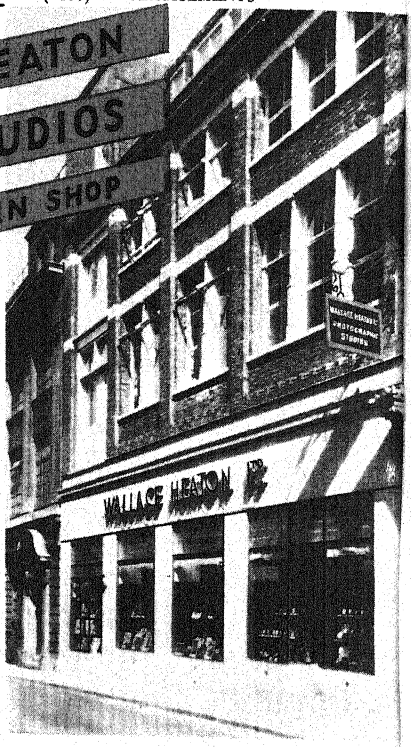
New Bond Street, London, W.1

43 KENSINGTON HIGH STREET, LONDON, W.8

Secondhand Bargain Dept.: 1 AVERY ROW, W.1

BY APPOINTMENT

THE WALLACE HEATON PHOTOGRAPHIC STUDIOS AND SECONDHAND BARGAIN SHOP



Out of value and service given in the past we have built up a Photographic Studio Organization occupying four large floors. Equipped with latest apparatus and working under ideal conditions we offer a still better service than ever.

At our secondhand bargain shop are to be seen the finest guaranteed offers in the trade.

A CUSTOMER WRITES:

CATTERICK.

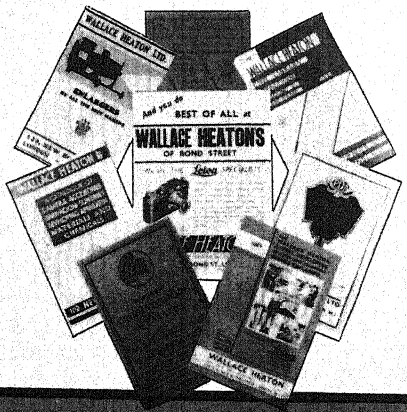
"I have been offered £5 for the camera by a dealer.... it certainly shows the quality of the camera which you kindly supplied at 50/-....taken as one of your standard dealings, I feel it my duty to inform anyone desiring a camera, that you are worthy of their patronage." T.G.S.

CINE TITLING AND EDITING

Films edited and titled for home or publicity purposes by an expert staff promptly and at competitive charges.

FILM LIBRARY

All the finest 9.5 mm. and 16 mm. silent and 16 mm. Sound-on-Film productions are included. Moderate rates of hire.



EIGHT SEPARATE FREE LISTS. The latest New Cameras and "minicameras"; cinematograph cameras and projectors; Enlargers; 16 mm. Film Library (Sound and Silent); 9.5 mm. Film Library (Silent); Accessories for better photography; Developing and enlarging service, etc. (with specimens); Guaranteed secondhand apparatus. Any List sent on request. (Postage extra).

EXCHANGES, EASY TERMS, APPROVAL. Good allowance on your surplus apparatus in exchange. Very easy terms and approval against full deposit to customers in Great Britain.

OVERSEAS ORDERS. These are dealt with in a special department where an expert staff is conversant with the needs of Overseas buyers.

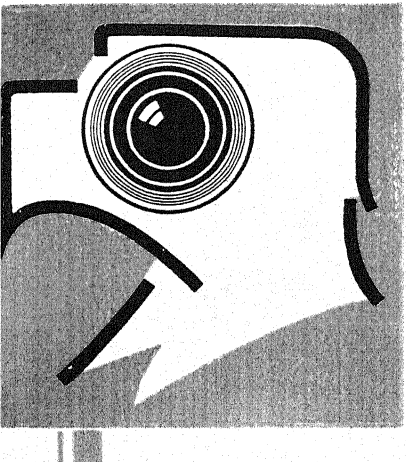
Customers are asked to give a good description of their requirements and send cash with order to ensure quick delivery.

WALLACE HEATON LTD.

127 NEW BOND STREET, LONDON, W.1

AND EIGHT OTHER LONDON SHOPS

ZEISS



The Eagle Eye
of your Camera

PHOTOGRAPHIC LENSES

BRITISH REPRESENTATIVES:

Carl Zeiss (London) Ltd.

Mortimer House, Mortimer St.,
London, W.1. *Tel. Mus. 9031-6*

ZEISS AGENTS:

New York: Carl Zeiss, Inc., 485 Fifth Avenue and at **Los Angeles, Cal.:** 728 So. Hill Street. **Montreal:** Hughes Owens Co. Ltd., 1440 McGill College Avenue, also at Ottawa, Toronto, Winnipeg, Vancouver. **Calcutta:** Adair, Dutt & Co., Ltd., Stephen House, Dalhousie Square (East). **Bombay:** Embassy House, Sir Phirozshaw Mehta Road. **Madras:** Khaleel Mansions, Mount Road. **Melbourne:** E. C. Heyne Pty., Ltd., Union Building, 100 Flinders Street, also at Sydney. **Johannesburg:** B. Owen Jones Ltd., Beresford House, 86, Main Street, and at **Paris, Milan, Brussels, Madrid, Buenos Aires, Rio de Janeiro, Wellington, N.Z., Singapore, Bangkok, Cairo, Beyrouth, Shanghai, Tokio, Peking, etc.**

CARL ZEISS
JENA

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JENA

UNIVERSAL OBJECTIVES

Tessars F/4.5, F/3.5, F/6.3,
Tessar F/2.8 for small cameras.

Double Protars F/6.3 to F/7.7 and Protar Sets (the single components may be used as long focus objectives at full aperture).

Dagor F/6.8 (back lens may be used stopped down as a long focus lens).

SPECIAL OBJECTIVES

FOR CINE WORK

Biotar F/1.4, ultra-rapid objective,
Tessar F/2.7,
Tessar F/3.5 of short focus,
Tele Tessar F/6.3 special objective of long focus,
Kino Tele Tessar F/4 rapid telephoto objective,
Sonnar F/1.4, ultra-rapid objective,
Sonnar F/2.8,
Sonnar F/4, special objective of long focus.

FOR CINE PROJECTION

The new KIPRONAR F/1.9 with foci 9 cm. to 20 cm. A projection lens of exceptionally high light-transmitting power and suitable for projection distances from 11 to 55 yds. Components easily accessible for cleaning. Only four glass-air surfaces.

FOR PORTRAITURE

Tessar F/4.5
Tessar F/3.5 } in the longer foci
Tessar F/6.3
Tessar F/5, f=50 cm. and f=70 cm.
Triplets F/4.8, f=50 cm., **F/5,** f=70 cm. and **F/7,** f=120 cm.
Tele Tessar F/6.3.

FOR SPECIALLY RAPID ACTION WORK

with Press and reflex cameras with focal plane shutters.
Biotessar F/2.8
and for the small size camera
Biotar F/2.
Sonnar F/1.5, F/2 and F/4.

FOR WIDE ANGLE WORK

Dagor F/9,
Protar F/18,
Hypergon F/22.

FOR AERIAL PHOTOGRAPHY

Tessar F/4.5,
Tessar F/5, f=50 and f=70 cm.
Triplets F/4.8, f=50 cm., **F/5,** f=70 cm. and **F/7,** f=120 cm.

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FOR TELEPHOTOGRAPHY and
Large Image Pictures

Tele Tessar F/6.3,
Magnar F/10, f = 45 cm.
Triplet F/7, f = 120 cm.
Composite Tele Objectives, particularly for specially long distance work.

FOR PHOTOGRAPHY WITH SPECIALLY SHORT WAVE ULTRAVIOLET LIGHT, ABOVE ALL FOR CRIMINOLOGICAL AND SCIENTIFIC WORK

Quartz Anastigmat F/4.5, with or without chromatic correction.

OPTICAL ACCESSORIES for PHOTO OBJECTIVES

DISTARS and PROXARS; attachment lenses for lengthening and shortening the focus.

YELLOW and GREEN GLASS FILTERS:

filters for neutralising the difference of colour perception between the eye, the Orthochromatic plate or the Panchromatic plate.

A-DUCARS: filters for colour photography with Agfa screen plates with or without lens effect for neutralising the plate thickness.

INFRA RED FILTERS: Glass filters coloured in the bulk.

HEROTAR POLARIZING FILTERS.

For the control of reflections from water, glass, porcelain, paper, enamel and most polished surfaces.
Available in slip-on mounts for front cell diameters of 28.5, 32, 37, 42 and 51 mm.

OPTICAL EQUIPMENT for PROCESS WORK

Apo Planar,
Apo Tessar,
with reversing prisms and mirrors,
revolving collars,
filter cells,
R-yellow filters and R-colour filters.

CARL ZEISS JENA

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ZEISS F/2.8 TESSAR

FOR SMALL CAMERAS

A new F/2.8 Tessar which comes under the new Tessar patents granted a few years ago. Angular field over 50° at full aperture. Definition brilliant and uniform as with all Zeiss Tessars.

The foci, 5 and 6 cm., can be fitted into the smallest size Compur Shutters 00 or 00R without loss of aperture, and their design enables them to be fitted to any small size camera which takes an F/3.5 Tessar, of the same focal length, in Compur Shutter. The longest focus available is 8 cm.

ZEISS R-BIOTAR F/0.85

A special objective of unequalled rapidity, designed in the first place for cineradiography, but since applied also to sound-on-film cine and other work. For standard and sub-standard film. Full details and particulars of standard cine cameras to which it has already been fitted, on application.

ZEISS BIOTAR F/1.4

CINE ANASTIGMAT

Definitely superior at all apertures to any other ultra rapid lens used at the same aperture.

Angular field about 42°. The 4, 5 and 7 cm. lenses amply cover standard film and the 2 and 2.5 cm. lenses narrow film (12.8 mm. diagonal).

ZEISS PHOTOMICROGRAPHIC APPARATUS

MIFLEX Universal Camera Attachment for plates 12 × 9 cm. and 9 × 6½ cm. or films 4 × 3 cm. and 36 × 24 mm.

A frosted observation screen, the use of ordinary microscope eye-pieces and rapid attachability are its outstanding features.

CONTAX-PHOKU (image size 36 × 24 mm.)

The photomicrographic adaptation of the ordinary CONTAX miniature camera.

STANDARD VERTICAL CAMERA II

A rigid universal outfit incorporating a suitable light-source. May be used for transmitted or incident light and in light or dark field.

CARLZEISS
JENA

KOSMOS



Vitegas de luxe

CHLORO-BROMIDE

Because of the rich warm tones and the very delicate scale of gradation which it gives, Vitegas de Luxe is more adequately described as a **super** Chloro-Bromide. It will give the photographer **any** tone he desires by the use of a warm tone developer.

Photographers who wish for that last touch of distinction often so difficult to obtain will find it in Vitegas de Luxe. Every year, every month, its increasing number of users is evidence of its growing popularity.

Obtainable in two speeds, contact and enlarging, so that enlargements of almost pigment-print quality can be turned out with as much ease as contact prints.

LIST OF GRADES AND SURFACES

Pearl Matt Card (White)	305B	Contact Speed
Cream Smooth Card	314B	
Cream Rough Card...	318B	
Pearl Matt Card (White)	405B	Enlarging Speed
Cream Smooth Card	414B	
Cream Rough Card...	418B	

KOSMOS Photographic Papers

KOSMOS PHOTOGRAPHICS

KOSMOS Photographic Papers

KOSMOS

KOSMOS Vitegas

CHLORO-BROMIDE

First introduced in 1913, Vitegas won immediate popularity. It gives attractive warm tones by development similar to Vitegas de Luxe, but Vitegas may also be toned by the usual sepia toning methods, such as hypo alum, sulphide and liver of sulphur. The best sepia tone is obtainable when development is complete in about two minutes, rapid development is likely to produce a very warm sepia which may not be desirable. Amongst the many attractive surfaces the most exacting user will find a grade and surface entirely suited to his particular needs.

LIST OF GRADES AND SURFACES

	Normal	Contrasty
Glossy Card	1B	C1B
Velvet Card	2B	—
Semi-matt Card	3B	—
Pearl Matt Card	5B	C5B
Cream Semi-matt Card	6B	C6B
Cream Smooth Matt Card...	7B	C7B
Cream Natural Surface Card	8B	—
Cream Silk Grain Card	11B	—
White Silk Grain Card	13B	—
White Egg-shell Grain Card	16B	—
Cream Egg-shell Grain Card	17B	—
Ivory Smooth Matt Card	55B	—
Ivory White Card	56B	—



KOSMOS Novex



GASLIGHT PAPER

A paper upon which the largest D. & P. concerns in all parts of the world have learnt to place their absolute reliability. Through a number of years it has proved its worth and continues to grow in popularity. Ask those who use it—they'll tell you of its charm, its clean and quick working and its ability to produce blue-black pictures of the liveliest sparkle whether the negative is thin or harsh in quality. Its latitude, freedom from staining and absolute reliability and uniformity are known and appreciated throughout the world.

LIST OF GRADES AND SURFACES

Glossy NOVEX Paper ...	201A	Soft, Normal, Vigorous, Extra Vigorous.
Glossy NOVEX Card ...	201B	Soft, Normal, Vigorous, Extra Vigorous.
Velvet NOVEX Paper ...	202A	Normal, Vigorous.
Velvet NOVEX Card ...	202B	Normal, Vigorous.

Post Cards can be supplied in all surfaces and grades coated on card base.

KOSMOS Photographic Papers

T GRAPHICS, LTD.
OTH, HERTS.

KOSMOS Photographic Papers



KOSMOS Bromide

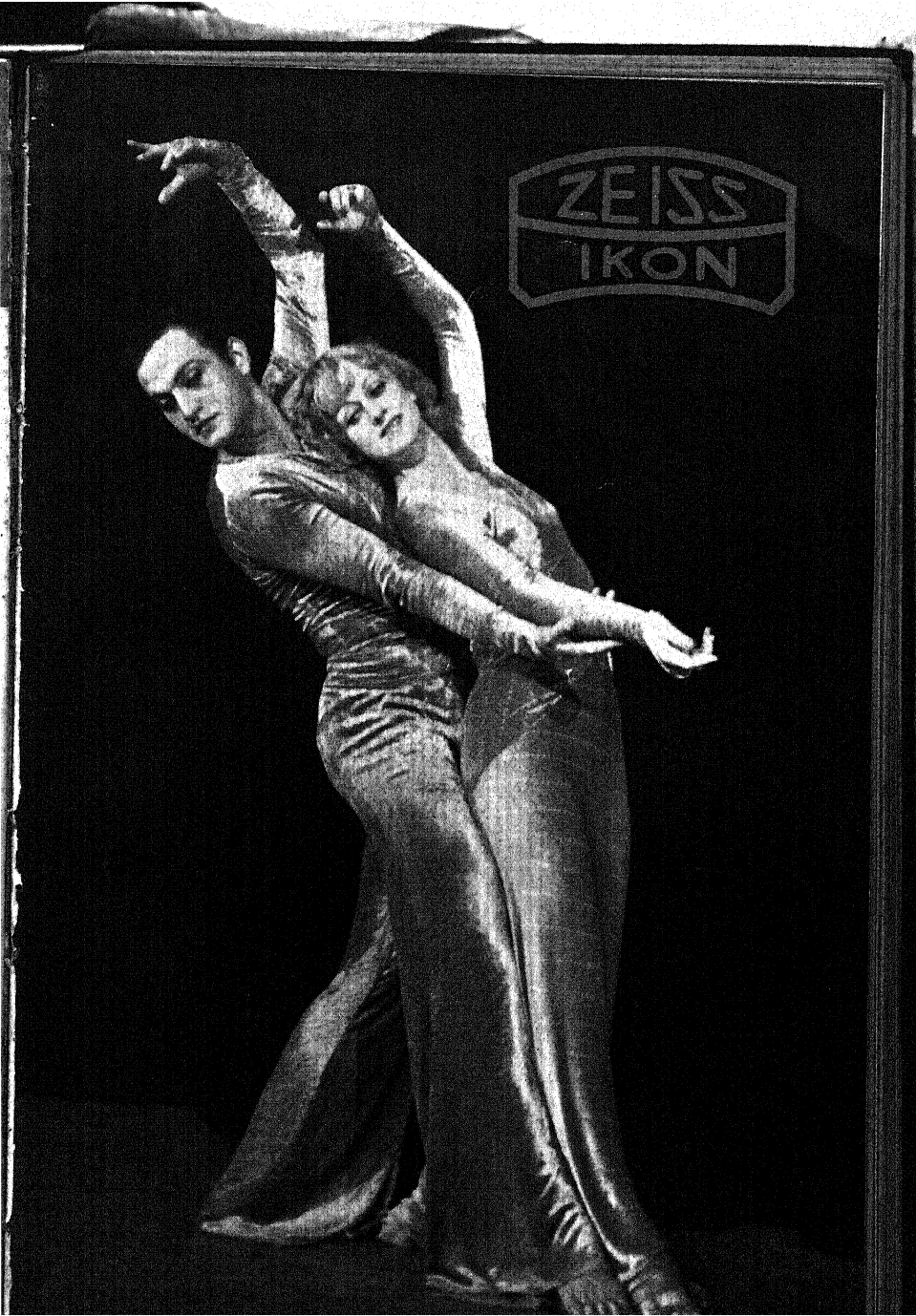
In the Kosmos range of Bromide Papers the professional press and commercial photographer finds his greatest asset. The unusually wide range of surfaces—some in as many as five different grades, from soft to super-vigorous—supplies him with a paper of the finest possible quality for every conceivable purpose. Whether the range of work is wide or highly specialised, there is a Kosmos Bromide which will give a hundred per cent. perfection from the negative. In addition to the surfaces listed below, there is also Kosmos Negative Card for while-you-wait (a la minute) studios.

LIST OF GRADES AND SURFACES

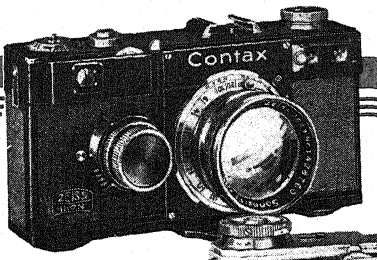
		Grade Nos.				
Glossy Bromide Paper, White	101A	1	2	3	4	5
Glossy Bromide Card, White	101B	1	2	3	4	5
Glossy Bromide Card, White, Extra Rapid	101BX	–	2	–	–	–
Glossy Bromide Paper, Mauve	112A	1	2	3	4	5
Glossy Bromide Card, Mauve	112B	–	2	3	4	5
Velvet Bromide Paper	102A	–	2	3	4	–
Velvet Bromide Card...	102B	1	2	3	4	–
Semi-matt Bromide Paper	103A	–	2	3	4	–
Semi-matt Bromide Card	103B	–	2	3	4	5
Rough Natural Surface-Bromide-Card ...	104B	–	2	3	–	–
Matt Bromide Paper	105A	–	2	3	4	–
Matt Bromide Card	105B	–	2	3	4	–
Cream Semi-matt Card	106B	–	2	3	–	–
Cream Matt Paper	107A	–	2	–	–	–
Cream Matt Card	107B	–	2	3	–	–
Cream Rough Natural Surface Card ...	108B	–	2	3	–	–
Cream Velvet Card	110B	–	2	3	–	–
Cream Silk Grain Card	111B	–	2	3	–	–
White Silk Grain Card	113B	–	2	3	–	–
Smooth Natural Surface Card	114B	–	2	3	–	–
Cream Smooth Natural Surface Card ...	115B	–	2	3	–	–
Rough Bromide Paper	140A	–	2	–	–	–

Grade No. 1—Soft. No. 2—Normal. No. 3—Vigorous.
No. 4—Extra Vigorous. No. 5—Super Vigorous.

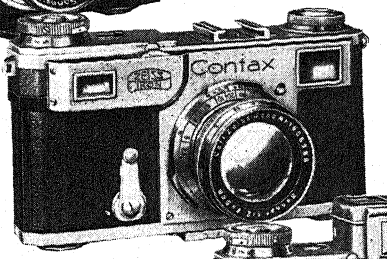
KOSMOS PHOTOGRAPHICS
FETCHWORTH, HERTS


ZEISS
IKON

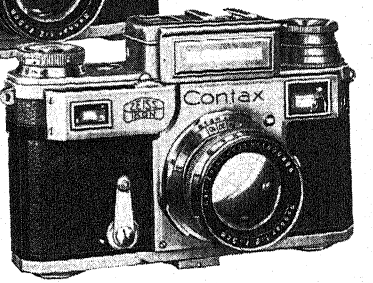
CONTAX



CONTAX I



CONTAX II



CONTAX III

The Contax is the universal miniature (24 × 36 mm.) precision camera. It provides a choice of ultra-rapid Zeiss lenses with apertures up to the Zeiss Sonnar *f*/1.5 and focal lengths 1⅛″ to 20″, all of which, except those of a longer focal length than 7″, can be used with the long-base patent rotating wedge distance meter.

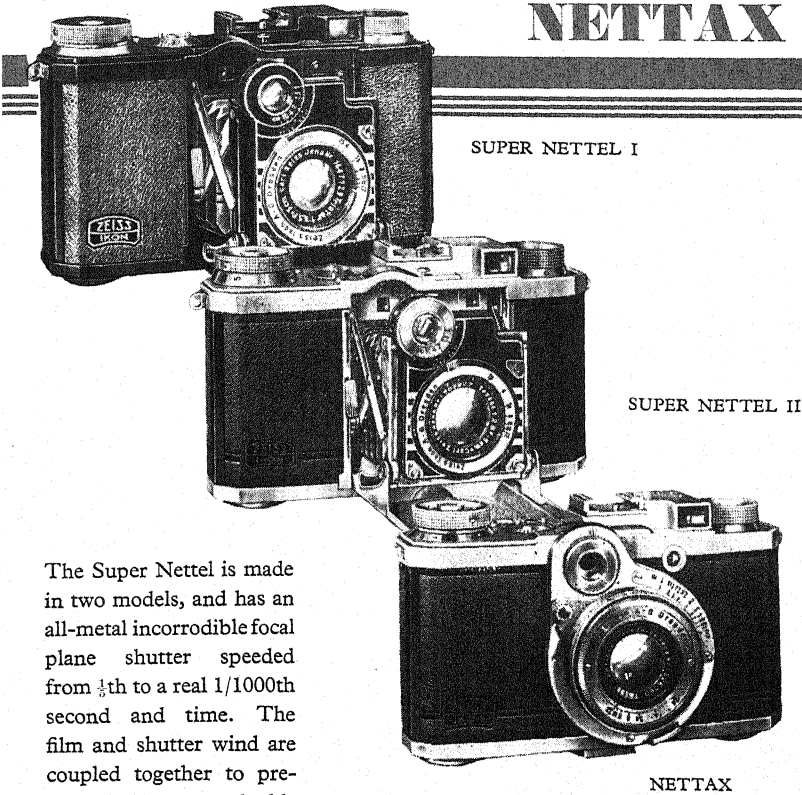
Models II and III have the view finder and distance meter images combined in one eye-piece, and Model III a built-in photo electric exposure meter. The metal focal plane shutter is speeded from ½ to 1/1000th second (1/1250th in models II and III, which also include a delayed action release), and time.

A wide range of accessories is available for the Contax which enable it to tackle the most diverse subjects, including landscapes, theatre photography, infra-red photography, photo-micrography, reproduction work, telephoto work, &c.

The Contax can be obtained with the following standard optical equipment:—
Zeiss Tessars *f*/3.5 or *f*/2.8; Zeiss Sonnars *f*/2 or *f*/1.5.

Prices from: Contax I ... £31 0 0
Contax II ... £40 10 0
Contax III ... £53 0 0

SUPER NETTEL and NETTAX



SUPER NETTEL I

SUPER NETTEL II

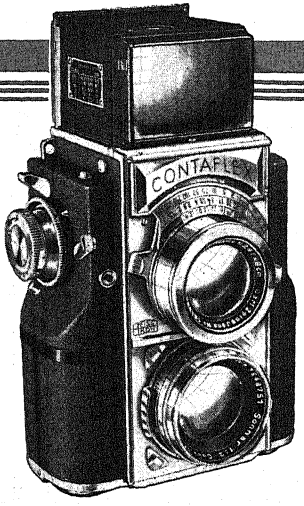
NETTAX

The Super Nettel is made in two models, and has an all-metal incorrodible focal plane shutter speeded from $\frac{1}{5}$th to a real 1/1000th second and time. The film and shutter wind are coupled together to prevent inadvertent double exposures, and the Zeiss lenses are focussed automatically by coupled rotating wedge distance meter.

The Nettax is more versatile than the Super Nettel, although its manipulation is similar. A wide angle Zeiss Tessar of $1\frac{1}{8}$″ focal length and a long focus Zeiss Triotar of $5\frac{1}{8}$″ can be used interchangeably. The Super Nettel and Nettax use the Contax size films, 24 × 36 mm.

Super Nettel I, with Zeiss Triotar or Zeiss Tessar *f*/3.5.	Prices from £18 12 6
Super Nettel II, de Luxe model, chromium finish, with Zeiss Tessar *f*/2.8.	£28 2 6
Nettax, with Zeiss Tessars *f*/3.5 or *f*/2.8.	Prices from £29 5 0

CONTAFLEX



The Contaflex represents a new conception in miniature camera design, and it is the first camera to be equipped with a built-in photo-electric exposure meter. The Contaflex takes the usual 24 × 36 mm. cine film, and is the only real miniature reflex. It provides a choice of six interchangeable Zeiss lenses, apertures up to the Zeiss Sonnar *f*/1.5, focal lengths up to 5⅜″.

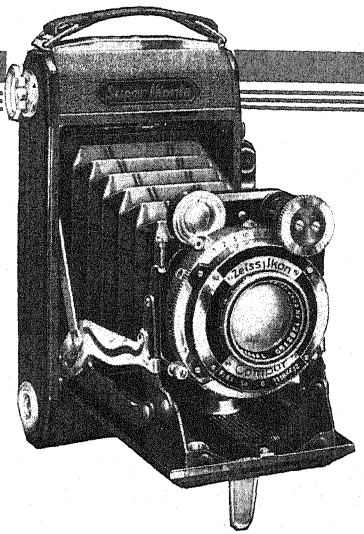
To overcome the difficulty which would be experienced in focussing such a small image as 1″ × 1½″ on the focussing screen the Contaflex has been equipped to show a double size picture on the focussing screen with the minimum depth of focus, in order that the ultra-rapid lenses may be focussed with the requisite precision. Automatic compensation for parallax ensures that everything seen in the finder will be recorded on the film. The Contaflex is equipped with an all-metal incorrodible focal plane shutter speeded from ½ to 1/1000th second, and has in addition a delayed action release.

The front and back of the finder hood form an Albada finder for sports work, and the reflecting surface on the front is invaluable for self-portraiture, as it reflects everything seen in front of the camera. The back of the Contaflex is detachable for cleaning, and permits the use of plates for photo-micrography, reproduction and other branches of scientific work. The Contaflex uses the Contax size films, 24 × 36 mm.

The Contaflex can be obtained with any of the following standard optical equipment :—

Zeiss Tessar *f*/2.8, Zeiss Sonnar *f*/2, Zeiss Sonnar *f*/1.5. Prices from £64 12 6

SUPER IKONTA



The demand of modern photographers for rapid lenses has made imperative such a series of cameras as the Super Ikonta for the usual roll films. The Super Ikonta is equipped with the famous Zeiss Lenses giving first-class definition at full aperture. To utilise the full lens aperture to advantage, all Super Ikontas are provided with the Zeiss Ikon patent rotating wedge distance meter which focusses with accuracy the objects situated in the plane or planes it is desired to take.

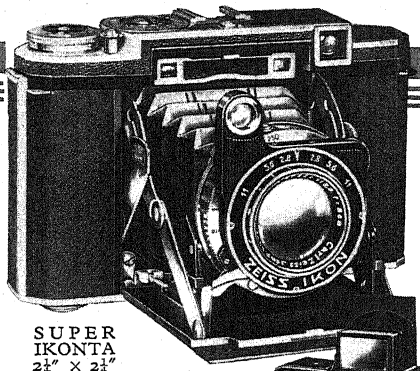
The Super Ikonta, $2\frac{1}{4}'' \times 1\frac{3}{4}''$, is the smallest in the series, and takes 16 pictures on the usual $3\frac{1}{4}'' \times 2\frac{1}{4}''$ spool. It will appeal to those requiring lightness and compactness in their instrument. The Super Ikonta, $2\frac{1}{4}'' \times 1\frac{3}{4}''$, can be obtained with the world-famous Zeiss Tessar *f*/3.5 and Compur rapid shutter to 1/500th second.

For those who require a larger picture there is the $3\frac{1}{4}'' \times 2\frac{1}{4}''$ size, which is provided with a mask so that 16 divided pictures can also be taken. This model provides a wide range of shutter and lens equipments, Zeiss Triotar *f*/4.5, Zeiss Tessars *f*/4.5 and *f*/3.8 and Compur rapid or normal shutters. To the devotee of an even larger picture the model for $4\frac{1}{4}'' \times 2\frac{1}{2}''$ pictures (or 16 $2\frac{1}{2}'' \times 2\frac{1}{8}''$ divided pictures) is ideal. This model can be obtained with either the Zeiss Triotar or Zeiss Tessar *f*/4.5 and Klio, Compur normal or Compur rapid shutters.

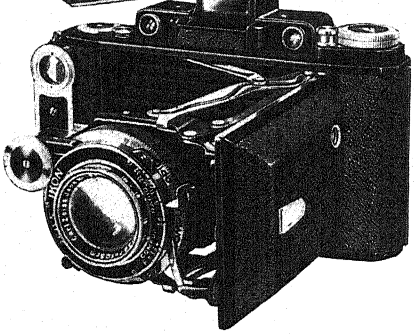
Prices from £14 · 7 6

For Super Ikonta, $2\frac{1}{4}'' \times 2\frac{1}{4}''$, and Super Ikonta Models II, see over.

SUPER IKONTA



SUPER
IKONTA
$2\frac{1}{4}'' \times 2\frac{1}{4}''$



SUPER
IKONTA II
$3\frac{1}{4}'' \times 2\frac{1}{4}''$

These models provide for the roll film camera user most of the advantages of the "miniature". The $2\frac{1}{4}'' \times 2\frac{1}{4}''$ model takes 11 pictures on the usual $3\frac{1}{4}'' \times 2\frac{1}{4}''$ roll film spool and Super Ikonta II can be obtained in two sizes, No. 531 for 16 pictures $2\frac{1}{4}'' \times 1\frac{3}{4}''$ on the usual $3\frac{1}{4}'' \times 2\frac{1}{4}''$ spool, and No. 531/2 for 8 pictures $3\frac{1}{4}'' \times 2\frac{1}{4}''$ or 16 pictures divided $2\frac{1}{4}'' \times 1\frac{3}{4}''$. The shutter release is conveniently situated on top of the camera body and the interlocking of film wind and shutter release prevents unintentional double exposures. The cameras are all elegantly finished in chromium plate.

Super Ikonta II, in addition to providing the interlocking of film wind and shutter release, is also equipped with a special signal which shows at a glance whether the film has been wound on or not. The wonderful Albada direct vision view finder for sports work is also provided. Optical and shutter equipment are available as follows :—

Code No.

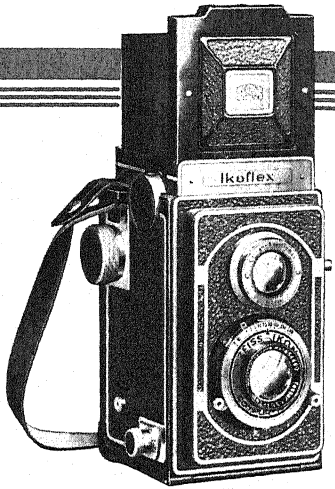
530/16. For $2\frac{1}{4}'' \times 2\frac{1}{4}''$ pictures, Zeiss Tessars *f*/3.5 or *f*/2.8 and Compur rapid shutter.

531. For $2\frac{1}{4}'' \times 1\frac{3}{4}''$ pictures, Zeiss Tessar *f*/3.5 and Compur rapid shutter.

531/2. For $3\frac{1}{4}'' \times 2\frac{1}{4}''$ pictures (or 16 divided pictures), Zeiss Tessar *f*/2.8 and Compur rapid shutter.

Prices from £23 7 6

IKOFLEX



The Ikoflex is a camera which will make an immediate appeal to the reflex worker. It takes 12 pictures $2\frac{1}{4}'' \times 2\frac{1}{4}''$ on the usual $3\frac{1}{4}'' \times 2\frac{1}{4}''$ roll film spool, and is provided with a special focussing screen, which gives a brilliantly illuminated picture even at the corners, with which to focus. This screen consists of a plano-convex lens ground on the under side and compensation for parallax is ingeniously provided for. The focussing lever automatically shows the depth of focus of the particular lens aperture in use, and the two lenses—the viewing and the taking lens—are accurately aligned and provide pictures of needle sharpness and real brilliance.

Into the hood, self-erecting, is fitted a direct vision view finder for use at eye-level when required, and also a large size magnifier for focussing needle-sharp pictures. All fittings are chromium plated and the appearance is both handsome and tasteful.

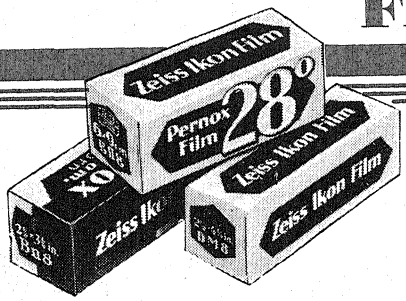
The Ikoflex II is equipped with the world-famous Zeiss Tessar *f*/3.5 or Zeiss Triotar *f*/3.5 and Compur rapid shutter to 1/500th second, or Compur normal shutter to 1/300th second respectively.

Ikoflex I is equipped with the Zeiss Ikon Novar *f*/6.3 or *f*/4.5 and the Ikoflex ever-set Derval shutter giving speeds of 1/25th, 1/50th and 1/100th second, or Klio shutter with delayed action release speeded 1, $\frac{1}{2}$, 1/5th, 1/10th, 1/25th, 1/50th, 1/100th and 1/175th second.

IKOFLEX II.
With Zeiss Tessar or Zeiss Triotar *f*/3.5, Compur rapid or normal shutters respectively.
Prices from £15 12 6

IKOFLEX I (SIMPLIFIED MODEL).
With Novar *f*/6.3 or *f*/4.5 and Derval shutter, or Novar *f*/4.5 and Klio shutter.
Prices from £6 12 6

ZEISS IKON FILM



The amateur should choose his film with the same care and attention to detail as he does his camera if he is to obtain the best results.

A good film must be very sensitive, fine grained, and have the quality of reproducing colours as naturally as possible; it must have every technical asset that modern manufacturing technique can provide. Those who lay weight on such matters should try Zeiss Ikon panchrom film, which is a film for work both by day and by night. Zeiss Ikon orthochrom film, although giving quite a good monochrome rendering of colour, is not quite so well sensitised for colours, and is thus a little cheaper.

This inset can give only brief particulars of the more important Zeiss Ikon models. In addition to the cameras mentioned Zeiss Ikon manufacture apparatus for every class of photographic work.

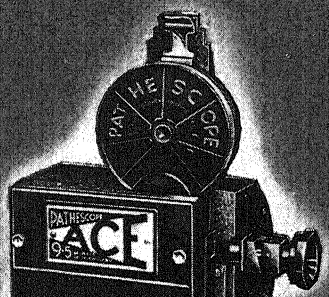
Copies of lists and other publications descriptive of any Zeiss Ikon instruments will gladly be sent free on request.

— OVERSEAS DISTRIBUTORS —

AUSTRALIA	E. C. Heyne & Co., 100, Flinders Street, Melbourne. Union Buildings, 8/14, Bond Street, Sydney.
BRITISH INDIA	Adair, Dutt & Co., Ltd., Sir Phirozshaw Mehta Road, Bombay. 5, Dalhousie Square East, Calcutta. Kaleeli Mansions, Mount Road, Madras.
BRITISH NORTH BORNEO	The North Borneo Trading Co., Sandakan.
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STRAITS SETTLEMENTS ...	The Scientific Instrument Co., 2, Finlayson Green, Singapore.
SOUTH AFRICA	B. Owen Jones, Ltd., Beresford House, Main Street. P.O.B. 2933, Johannesburg.
BRITISH WEST AFRICA ...	Woermann & Co., Station Road, Accra, Gold Coast.
U.S.A.	Carl Zeiss, Inc., 485, Fifth Avenue, New York.

Enquiries from other territories to be addressed:
ZEISS IKON A.G., DRESDEN A. 21, GERMANY.

ZEISS IKON, LTD., 79, Mortimer House, Mortimer Street, London, W. 1.



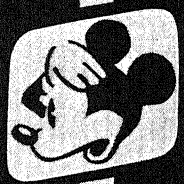
Lights out

AND THE SHOW IS ON

PATHÉSCOPE

SOUND AND SILENT

PRESENTING WORLD FAMOUS FILM STARS



ONLY 37/6 READY TO USE



THE

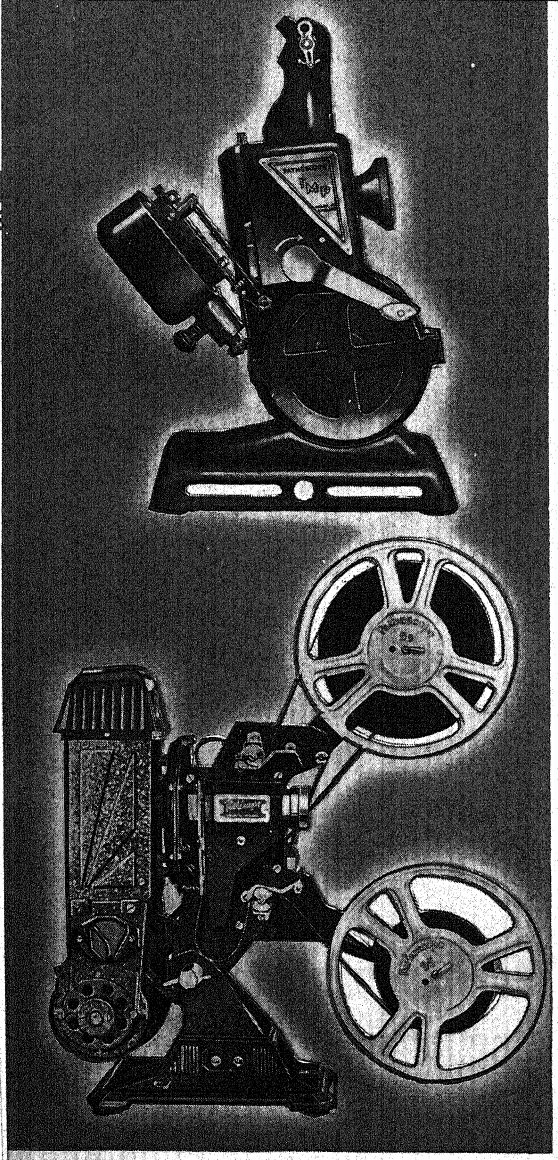
9.5 mm. "ACE"

(BRITISH MADE)

Here is the smallest and least expensive Pathéscope 9.5 mm. outfit for showing real motion pictures in your home. Made throughout of solid high pressure die castings, with the shutter and optical system designed on the best cinematographic principles, the "ACE" gives a brilliantly illuminated picture 2 ft. wide or more at 8 ft. between projector and screen.

The "ACE" is supplied complete with resistance for all voltages between 110 and 250, or it can be used with accumulators where other electricity is not available. Hand-cranked for 30 ft. and 60 ft. reels, or with Super Attachment for showing 300 ft. reels for 10/6 extra.

"ACES" ARE TRUMPS



The 9.5 mm. "IMP"-roved Model

(British Made)

One of the finest miniature home cinemas, complete in all details, for every home. The "Imp" provides brilliantly illuminated, steady and correctly centred pictures. Note the easy film threading through the pivoted lamphouse and the compactability of the outfit. The "Imp" for all voltages or for use with accumulators, for showing 30 ft. and 60 ft. reels.

The "Imp" can be fitted with a MOTOR DRIVE (£1. 15. 0) and a SUPER ATTACHMENT (17/6) for showing 300 ft. of film at one time, or the complete motor-driven outfit for showing 300 ft. of film bought outright for £7. 0. 0.

HAND TURNED COMPLETE WITH RESISTANCE

£4. 12. 6

THE 9.5 mm. "200-B"

(British Made)

Fitted with a 200 watts lamp for direct and brilliant screen illumination. The ideal projector for use on every occasion, especially when large pictures are required. Removal and re-winding of films at will; steady projection; fan-cooled and asbestos-lined lamphouse and sprocket feed. Pictures 8 ft. wide and more easily obtainable. For use on all D.C. and A.C. mains from 200 to 250 with Double Resistance, or direct on 100-110 volts supply.

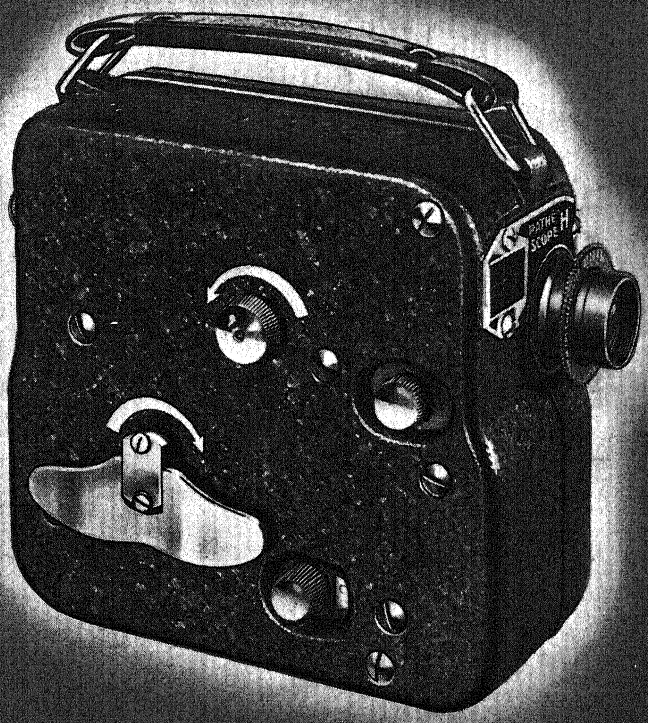
Resistance with lamp switch and separate terminals for voltages between 200 and 250 - - £1. 15. 0.

£15

This projector can be adapted for 12 volts and 50 volts electricity supplies.

"200-B" with 12 volt motor - £17.
"200-B" with 50 volt motor - £16.

PATHÉ SCOPE



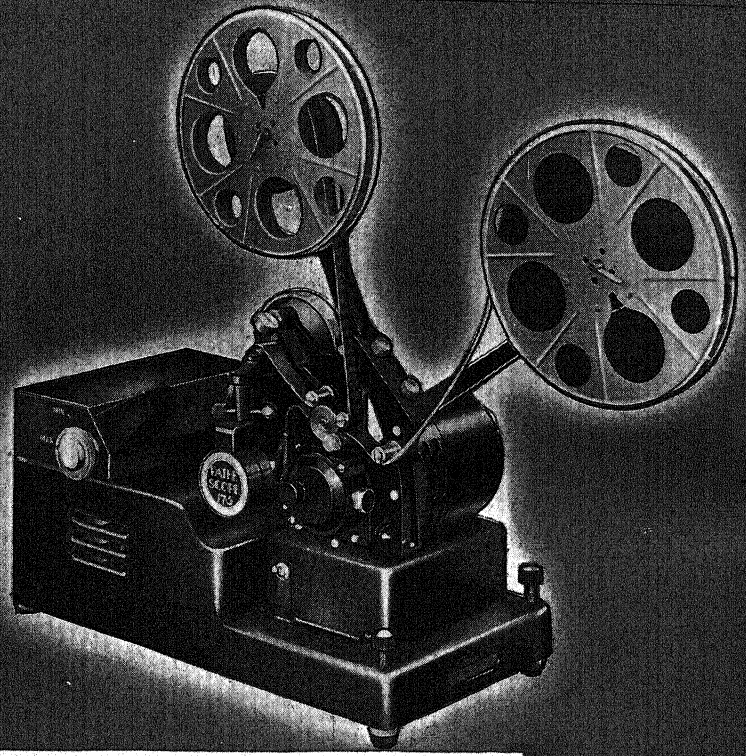
THE NEW 9.5 mm. MOTOCAMERA "H"

The smallest and lightest of all amateur cine cameras.

The "H" is fitted with a fully-corrected f/2.5 anastigmat lens for good—consistently good—results and a SINGLE PICTURE DEVICE for snapshotting. Other features include solid die-castings, double-claw movement, and a brilliant eye-level built-in view-finder. The motor is sweet, silent running, and daylight loading is a matter of seconds only. Size $4\frac{3}{4}''$ x $2\frac{1}{8}''$ x $4\frac{1}{2}''$ and weighing only $2\frac{1}{4}$ lbs. Takes the improved Vest Pocket "H" charger of film supplied in Orthochromatic and Panchromatic emulsions at 4/6 and 5/6 per reel respectively, inclusive of the cost of processing and providing over 1,000 single pinsharp pictures.

£6. 6. 0

HOME MOVIES



SEE AND HEAR THE

Pathéscope 17.5 mm. Talkie

(BRITISH MADE)

There's no bother with the Pathéscope Talkie. You simply plug into A.C. Mains to obtain pictures 8 ft. wide, with marvellous sound reproduction from the full standard size width sound track. There is volume for the drawing room, or if desired, the village hall holding 500 people, by means of the specially designed photo-electric pick-up, amplifier and moving coil loud-speaker. Only one lamp is used for projection and reading the sound-track, and in all other respects this Talkie is equally economical. Full Library Service is guaranteed, a good selection of films being available—and more in preparation—for hire or purchase outright at a fraction more than for silent films.

Supplied complete: Projector, Amplifier and Loud-speaker for **£60**

BE "O.K." FOR SOUND WITH THE PATHÉSCOPE TALKIE

PATHÉSCOPE LIMITED

10 GREAT MARLBOROUGH STREET, LONDON, W.1

AND NORTH CIRCULAR ROAD, CRICKLEWOOD, N.W.2

Meyer

PHOTOGRAPHIC LENSES for CINE or STILL

COMMERCIAL AND AMATEUR

PRIMOPLAN F/1.5

ULTRA SPEED. SUPER DEFINITION AND BRILLIANCY

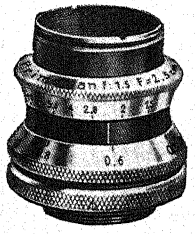
Fully corrected Anastigmat over a field of 40 degrees. **MADE ONLY IN 1" FOCUS**

In special focussing mount, interchangeable, for:

BELL HOWELL 70 D and 70 DA. VICTOR.
PAILLARD. AUTOKINCAM. ARGUS.

£16 10 0

	£ s. d.
Special mount for Agfa Movex or Siemens D .. ..extra	0 15 0
Special mount for Ciné-"Kodak" Special, with finder .. ..extra	2 10 0
Special mount for new Magazine Ciné-"Kodak" .. .. ..extra	1 0 0



Sole Distributor **A. O. ROTH**

Telegrams "Mentorflex Catgreen, London"



MEYER KINO PLASMAT F/1.5

(Patent Dr. Rudolph)

Full colour correction for the spectrum.

In recent years, films in natural colours have been on the increase. The natural reproduction of the various colours can only be obtained with a lens of high degree in colour correction—**THE MEYER PLASMAT.**

The Plasmat is favoured amongst cine workers in monochrome and colour. It is admittedly the best lens. True to colour. Fast in performance. Perfect definition.

Focus		Supplied in Interchangeable Focussing Mounts to Cameras as below:	Price		
inches	mm.		£	s.	d.
1/2	15	(A) Wide Angle. Filmo 70a, DA., D. and 75., Victor Ensign, Argus	14	15	0
3/4	20	(B) For Agfa Movex, Alef, Eumig, Pathe Motocamera De Luxe 9.5 mm. Also for apparatus under A. ...	14	15	0
1	25	(C) For all Movie Cameras as under A. Also Kodak BB and K, **Cine-Kodak Special**, Siemens D and F, Argus	16	10	0
1 1/2	35	(D) Professional. Bell Howell, Eyemo 71, 71C, Debrie, De Vry, etc.	19	10	0
1 3/4	42	(E) For all cameras as under D.	24	0	0
2	50	(F) For all cameras as under D.	26	5	0
Special Mount for Agfa Movex or Siemens D ... ... extra			0	15	0
Special Mount for Ciné-Kodak Special, with finder ... ... ,,			2	10	0
Special Mount for New Magazine Ciné-Kodak ... ... ,,			1	0	0
Special Mount for Kodak BB. and K. ... ... ,,			1	5	0

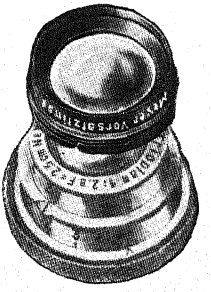
MEYER TRIOPLAN ANASTIGMAT F/2.8

Excellent definition at full and small apertures.

Moderate Price

Focus			Focussing Mount		
inches	mm.		£	s.	d.
1/2	15	Wide Angle. For cameras as under (A) above	8	4	0
3/4	20	For cameras as under (B) above	8	4	0
1	25	For cameras as under (C) above	8	4	0
2	50	For cameras as under (B) and (C) above as Telephoto Lens	9	15	0
3	75	For cameras as under (B) and (C) above as Telephoto Lens	11	5	0
4	100	For cameras as under (B) and (C) above as Telephoto Lens	13	0	0

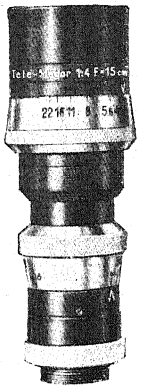
Extra charge for fitting of 2", 3" and 4" focus, from £1 0 0 to £2 10 0 according to focus, inclusive finder.



Sole Distributor

A. O. ROTH

Telegrams "Mentorflex Catgreen, London"



Meyer Tele-Megor F/4 and F/5

TELEPHOTO ANASTIGMAT OF HIGH SPEED

Critical Definition

Suitable for Monochrome and Colour Films

FOUR LENS CONSTRUCTION. COMPACT. LIGHT

In interchangeable focussing mounts

Focus	For	Price	Extra for Special Mount for	Price
inches		£ s. d.		£ s. d.
3, F/4	Bell Howell	10 5 0	Agfa Movex and Siemens D.	0 15 0
4, F/4	Paillard ...	12 15 0	Ciné-Kodak Special with Finder ...	2 10 0
6, F/4	Fnsign ...	16 18 0	New Magazine Ciné-Kodak	1 0 0
6, F/5.5	Argus, etc.	15 5 0	Kodak BB. and K. ...	1 5 0

Meyer Kinon Superior F/1.6

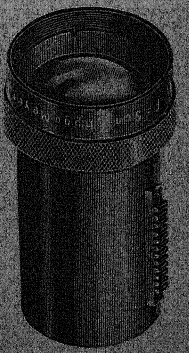
THE BEST PROJECTION ANASTIGMAT FOR 9.5 mm. 16 mm. 35 mm.

Perfect Screen Definition to the edges

Free from stray light. No Colour fringe

Supplied in special mountings to suit

BELL HOWELL, VICTOR, BOLEX, ENSIGN, KODAK, etc.



Focus inches	£ s. d.	Focus inches	£ s. d.
1⅜ ...	5 5 0	2	5 5 0
1⅝ ...	5 5 0	2½	5 10 0
3″	£5 15 0		

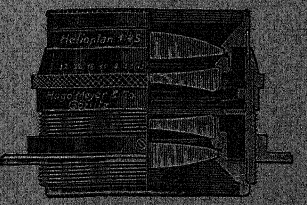
For Short Throw and Large Screen Pictures:
15 mm., 20 mm. and 25 mm. (1″) Projection
Anastigmat F/2.8 ... ... 5 5 0

Meyer Helioplan Anastigmat F/4.5

FOR ENLARGING

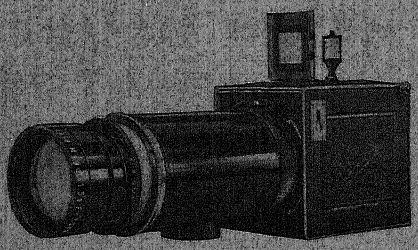
FREE FROM DISTORTION, FLARE AND COLOUR DEFECTS

Focus	Negative Size		Code Word	Price
inches	cm.	inches		£ s. d.
2½	24 × 36mm.	1 × 1½	Helena	5 12 0
2¼	3 × 4	1¼ × 1¾	Helena	5 12 0
3	6 × 6	2⅜ × 2⅜	Helenin	5 12 0
3½	6 × 6	2⅜ × 2⅜	Heliade	5 18 0
4¼	6 × 9	3½ × 2½	Heliand	5 18 0
4¾	9 × 12	4½ × 3½	Heliast	6 5 0
5¼	9 × 12	4½ × 3½	Helling	6 15 0
6	10 × 15	6 × 4	Heliokon	7 12 0
6½	10 × 15	6 × 4	Helios	10 15 0
7	13 × 18	7 × 5	Helium	12 10 0
8½	13 × 18	7 × 5	Heliotrop	15 5 0
10	18 × 24	8½ × 6½	Helias	22 10 0



Telephone Hither Green 2424

85 Ringstead Rd., CATFORD, LONDON S.E.6



MEYER LENSES for Primarflex

6 x 6 cm. Camera, with Trioplan F/2.8, Focus 4″

£31 10 0

Extra Interchangeable Lenses

		£	s.	d.
Makro-Plasmat	F/2.7, Focus 4½″	25	15	0
Primotar	F/3.5, Focus 5½″	17	0	0
Primotar	F/3.5, Focus 7½″	26	12	0
Tele-Megor	F/5.5, Focus 12″	29	7	6
Tele-Megor	F/5.5, Focus 16″	34	17	6

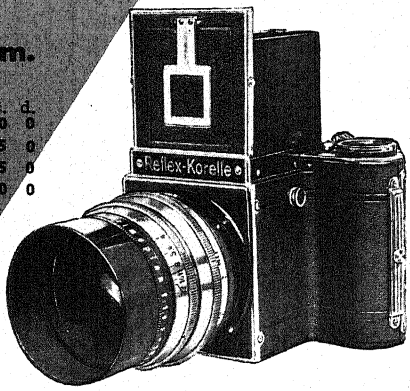
Korelle 6 x 6 cm.

Extra Interchangeable Lenses

	£	s.	d.
Meyer Primoplan F/1.9 Focus 4″ **	35	0	0
Tele-Megor, F/5.5 Focus 6″ ...	12	5	0
Tele-Megor F/5.5, Focus 7½″ ...	17	5	0
Tele-Megor F/5.5, Focus 12″ ...	27	0	0

**Extra for special camera front panel... £1 10 0

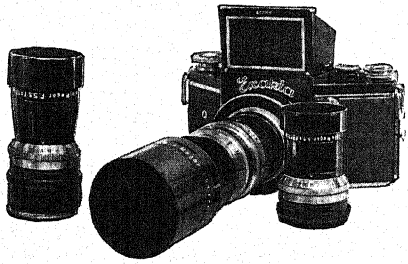
Between Adapters for Standard lens ... 18 0



New Exakta 24 x 36 mm.

Extra Interchangeable Lenses

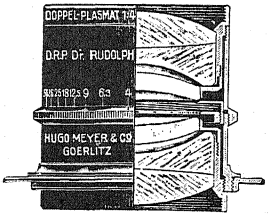
	£	s.	d.
Meyer Primoplan F/1.9, Focus 2″ (50 mm.) ...	20	0	0
Tele-Megor F/5.5, Focus 6″ ...	12	5	0
Tele-Megor F/5.5, Focus 7½″ ...	17	5	0
Tele-Megor F/5.5, Focus 10″ ...	26	15	0



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Telegrams "Mentorflex Catgreen, London"



MEYER DOUBLE PLASMAT F/4

(Patent Dr. Rudolph)

COMBINABLE

Completely corrected for Colour.

Foci $2\frac{1}{8}$″ to 19″

Equally suitable for Monochrome or Colour Photography

PRICES

Combined Focus	Single Component	Standard Mount £ s. d.	Sunk Mount £ s. d.	Plate Covered at Full Aperture inches	Code Word Std. Mt.	Code Word Sunk Mt.
inches	inches					
$3\frac{1}{2}$	6	14 7 6	15 0 0	$3\frac{1}{4}$ × $2\frac{1}{4}$	Pacos	Pardel
$4\frac{1}{4}$	$6\frac{3}{4}$	15 0 0	15 12 6	$3\frac{1}{4}$ × $2\frac{1}{4}$	Paddy	Pardo
$4\frac{3}{4}$	$7\frac{3}{8}$	16 17 6	17 10 0	$4\frac{1}{4}$ × $3\frac{1}{4}$	Padua	Pari
$5\frac{1}{2}$	$8\frac{3}{4}$	18 15 0	19 7 6	$4\frac{1}{4}$ × $3\frac{1}{4}$	Paga	Parnon
6	$9\frac{5}{8}$	20 0 0	20 12 6	$4\frac{1}{4}$ × $3\frac{1}{4}$	Page	Paros
$6\frac{1}{2}$	$10\frac{5}{8}$	20 12 6	21 17 6	$5\frac{1}{4}$ × 4	Pagine	Pescha
7	12	26 5 0	27 10 0	6 × 4	Pagus	Papius

PLASMAT SET F/4.5 (3 foci)
Prices on application

DOUBLE PLASMAT F/5.5
Prices on application

MEYER TRIOPLAN SERIES F/3-F/3.8

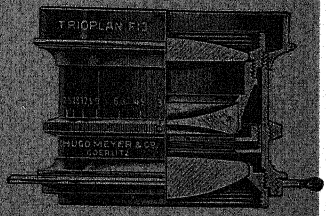
The supreme speedy studio Anastigmat.
Perfect definition. Exquisite modelling.

COMMERCIAL — FASHIONS — PORTRAITURE

Foci from $10\frac{1}{4}$″ to $16\frac{1}{2}$″ can be supplied with automatic soft focus mechanical adjustment, £7 10 0 extra.

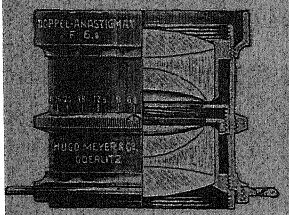
Silent front Studio Shutters £4 5 0 to £8 2 6.

Focus	Standard Mount £ s. d.	Square Flange £ s. d.	Suitable for inches
inches			
$10\frac{1}{4}$	31 5 0	0 15 0	7 × 5
12	36 5 0	1 0 0	$8\frac{1}{2}$ × $6\frac{1}{2}$
14	50 0 0	1 5 0	$8\frac{1}{2}$ × $6\frac{1}{2}$
$16\frac{1}{2}$	72 10 0	1 10 0	10 × 8
19	87 10 0	1 15 0	10 × 8



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In Foci from 1⅛" to 30"

Meyer Double Anastigmat F/6.8

COMBINABLE

For Commercial Photography of every description

FREE FROM FLARE

High Degree of Colour Correction

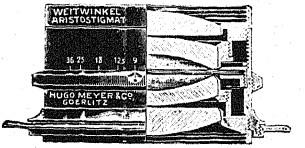
PRICES

Focus inches	Standard Mount £ s. d.	Sunk Mount £ s. d.	Covers inches	Code Word Standard Mount	Code Word Sunk Mount
6½	10 12 6	11 5 0	6½ × 4¼	Vaida	Dank
8½	17 10 0	18 2 6	8½ × 6½	Vallid	Darm
10¼	25 0 0	—	10¼ × 8½	Vampir	—
12	31 5 0	—	12 × 10	Vanad	—
14	38 2 6	—	14 × 12	Vanloo	—
16½	50 0 0	—	16 × 12	Vapeur	—
19	65 0 0	—	17½ × 16	Varazze	—
24	87 10 0	—	24 × 20	Valpo	—
30	118 15 0	—	28 × 22	Varde	—

MEYER WIDE ANGLE ARISTOSTIGMAT F/6.3 Angle 105°

THE MOST SPEEDY WIDE ANGLE LENS WITHOUT FLARE

EXCELLENT DEFINITION TO THE CORNERS



In Foci from 3½" to 10¾"

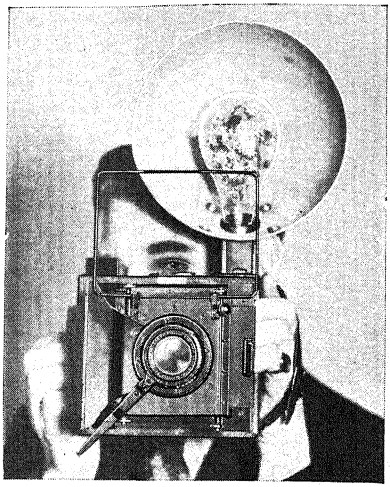
PRICES

Equivalent Focus ins.	At full aperture	Standard Mount £ s. d.	Code Word	Vario-Shutter £ s. d.	Code Word	Ibsor Shutter £ s. d.	Code Word	Compur Shutter £ s. d.	Code Word	Adapter Ring s. d.
3½	4½ × 3½	6 15 0	Zirpe	8 5 0	Wabe	10 10 0	Wallone	12 0 0	Wespe	6 3
4	6 × 4	7 3 9	Zicke	8 13 9	Wache	10 18 9	Walnut	12 8 9	Wette	6 3
4¾	7 × 5	7 10 0	Zirkel	9 0 0	Wachtel	11 5 0	Walze	12 15 0	Weste	6 3
5½	8½ × 6½	8 5 0	Zimmer	9 15 0	Waffel	12 0 0	Wange	13 10 0	Wimpel	6 3
6½	9 × 7	9 15 0	Ziege	11 13 9	Wahl	14 5 0	Wanne	15 15 0	Winkel	6 3
7	10 × 8	12 0 0	Ziel	—	—	16 10 0	Warte	18 0 0	Winzer	6 3

Sole Distributor

A. O. ROTH

Telegrams "Mentorflex Catgreen, London"



Roth Superspeed Focal Plane Camera

9 x 12 cm.

QUICK WIND.

Self-capping shutter Model I

Non-capping shutter Model II

SPEEDS 1/1000—1/5th B. and T.

Strong, quick erecting, four strut construction.

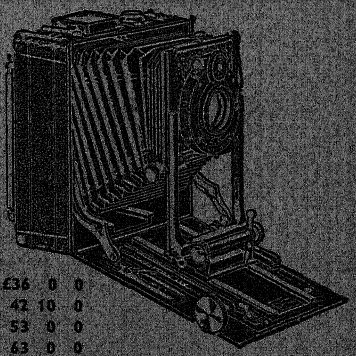
RIGID AND PORTABLE. THE PRESSMAN'S CAMERA

Fitted Meyer F/3 Anastigmat, focus 6" and 3 Double Dark Slides ... £51 5 0
Fitted Meyer F/4 Anastigmat, focus 6" and 3 Double Dark Slides ... 40 3 0
Other sizes. Prices on application.
Extra Slides ... ... each **£2 5 0** | Film Pack Adapter ... **£2 5 0**
Single Slides and Adapter, Automatic Changing Boxes, Lens Hoods, Filters, etc., also supplied.

SOLE AGENTS FOR MENTOR REFLEX CAMERAS, ALL TYPES MENTORETT, MENTOR STEREO CAMERAS, ETC.

SILAR

The Modern Universal Camera for all-round Photography.



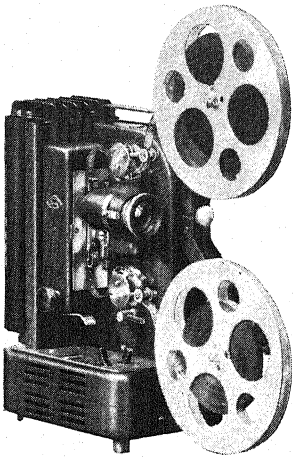
Triple Extension. Revolving Back.

With a name for Precision and Efficiency.

3½ × 2½, fitted Meyer Double Plasmat	F/4	£36	0 0
9 × 12 cm. (¼-pl.)	F/4	42	10 0
10 × 15 cm. (P.C.)	F/4	53	0 0
13 × 18 cm. (¼-pl.)	F/4	63	0 0

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HOME MOVIES

16 mm., 9.5 mm., 8 mm.

Eumig Super.
Meyer Kinon Superior F/1.6 Lens (400 W).
£29 0 0

Eumig P111.
Meyer Kinon Superior F/1.6 Lens (250 W).
£17 17 0

Pathe 200B. 9.5 mm. only.
Meyer Kinon Superior F/1.6 Lens (200 W).
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PAILLARD, BOLEX, SIEMENS, BELL HOWELL, VICTOR, ENSIGN, ETC., at Makers' Prices.

CINE CAMERAS. Sub-Standard

16 mm., 9.5 mm., 8 mm.

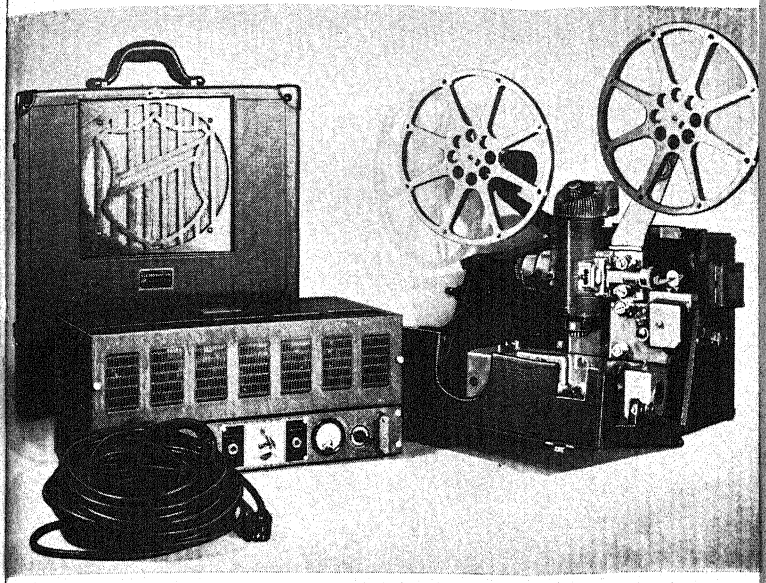
BELL HOWELL, PAILLARD, ENSIGN and all other well-known makes supplied with Meyer Plasmat F/1.5, Meyer Primoplan F/1.5 and

MEYER TELEPHOTO LENSES

MEYER LENSES ARE OBTAINABLE THROUGHOUT THE WHOLE WORLD

For fuller information of the comprehensive range of **Meyer Lenses** and authoritative advice, whether in the sphere of **Cine or Still, Professional or Amateur, Scientific or Technical,** please write to the nearest Principal, Hugo Meyer Branch, as given on page 516.

Sole Distributor **A. O. ROTH** Telegrams "Mentorflex Catgreen, London"



1,000 WATT

FILMOSOUND

is the ideal 16mm. equipment for semi-permanent installation in small halls, giving a professional standard of brilliant steady pictures with perfectly synchronised sound, devoid of any "carry-over" with consequent "flutter" in sustained notes. With a greater illumination power than any other 16mm. projector, the Filmosound's 1,600 foot capacity permits 45 minutes continuous projection.

The separate motor for film take-up also provides power for rapid re-winding, and provision is made for an extra Filmosound Auditorium Projector. Operating at either 24 or 16 frames per second, silent films can also be shown, and for larger halls the standard 2 in. F/1.65 lens can instantly be replaced by one of the interchangeable lenses.

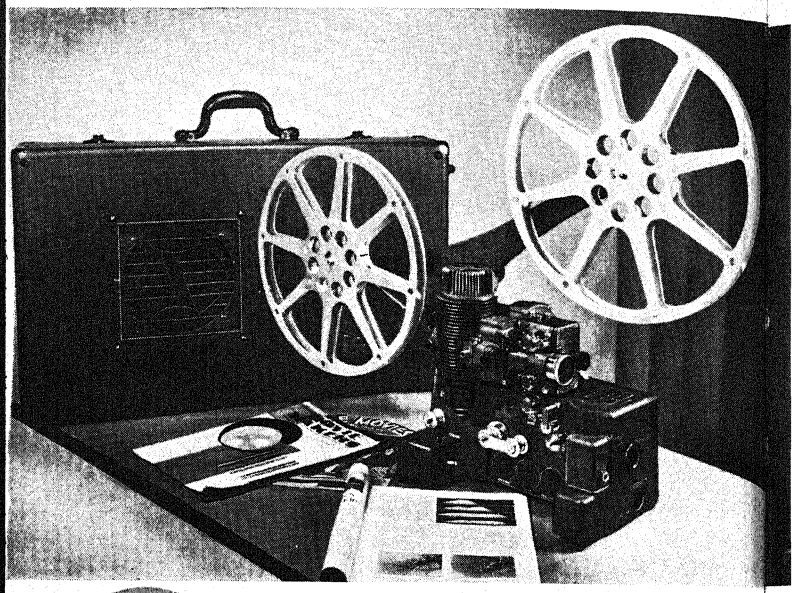
In addition, this remarkable equipment embodies a radio interference eliminator ; film cooling and re-humidifying device ; pilot light ; snubber to cushion film against take-up tension ; a two-way tilt ; a variable lamp resistance ; volt meter and provision for multiple speaker installations.

In all respects this is the apparatus for the amateur who wishes to give a performance technically equal to that at any cinema and for the lecturer and the salesman.

LONDON . . Head European Offices : 13 and 14 Gt. Castle Street, Oxford Circus, London, W.1.
CHICAGO . . Head Office and Factory : 1,801 Larchmont Avenue.
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MODEL 138 FILMOSOUND

Of typical Bell-Howell standard of quality, this apparatus is housed in a single case and is the answer to the demand for a really efficient talkie outfit for the home, the lecture hall and the sales room. Its capacity of 1,600 feet provides 45 minutes continuous entertainment and the rewind is rapidly effected by motor. Among the special features that recommend Filmosound 138 are the following :—

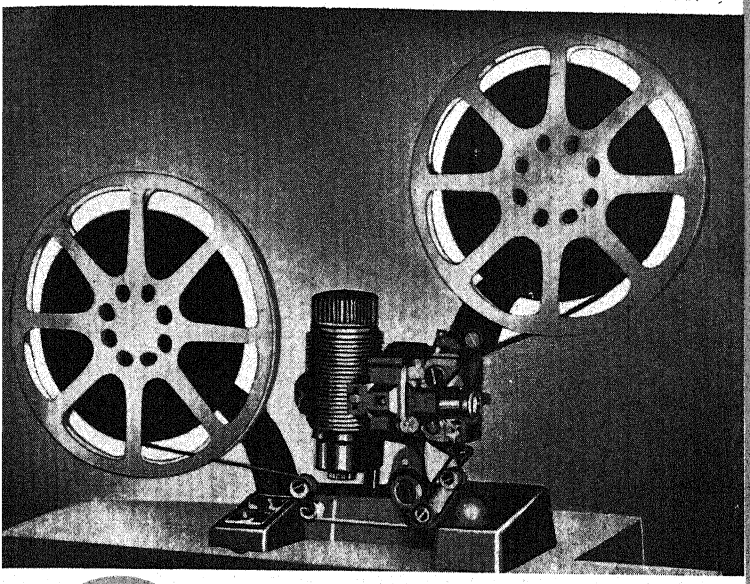
The new sound head incorporates a rotating sound drum, fly wheel and float idler. Voltages and exciter and photocell are balanced automatically with changes in volume control. Amplifier tubes are of the new metal type. The one-hand tilt device is a great convenience.

FILMOSOUND 138 MODELS.

Filmosound 138-C : 750-watt lamp ; sound (24) and silent (16) film speeds ... ...
Filmosound 138-D : Same as above but for 25-cycle current only ... ...
Filmosound 138-E : For 32-volt current. 400-watt 32-volt lamp ... ...

The above outfits of Filmosound are complete in a single case, ready for use, and include all necessary connecting cables and an extension current supply cord, all lamps and tubes, an extra exciter lamp, a 1,600-foot take-up reel, aperture cleaning brush, spare fuses, and oil and can.

BELL & HOWELL



16mm. MODEL 129

FILMO PROJECTOR

A sturdy instrument of infinite precision that will give a lifetime's wear and complete satisfaction. Here are some of its features. 1,600 foot film capacity, permits a full hour's show without a stop. Low centre of gravity, achieved by the low "streamlined" base and the "fore and aft" placing of reels. A very desirable feature especially in a large capacity projector. Two-way tilt. Turning a knob on the base tilts the projector up or down. Manual framer for out-of-frame pictures. Fast power rewind by touching a lever. Reverses and stills, with safety shutter for adequately protecting the film.

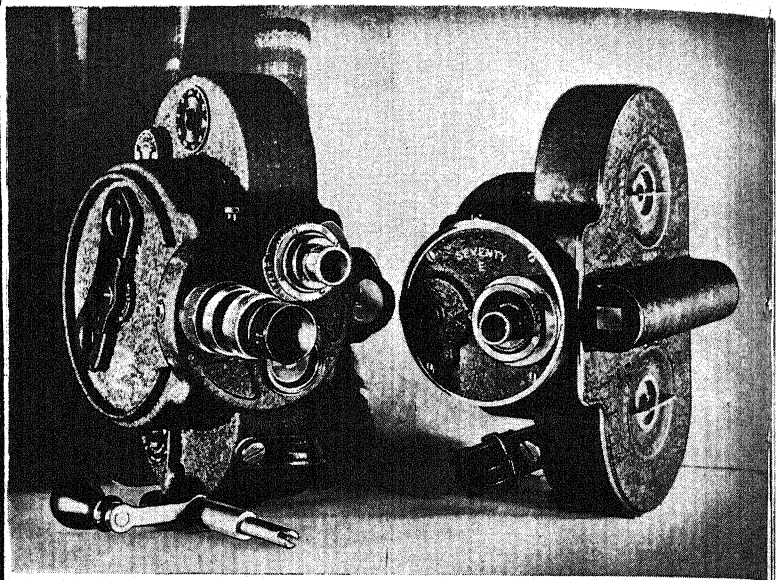
A full range of interchangeable lenses makes the 129 suitable for quite small rooms up to large halls.

Pilot light provides ample illumination for threading and operating the projector in a darkened room. Adequate cooling. The 750 watt lamp is kept within its maximum safe temperature of 500 Centigrade, thus greatly prolonging its life. Strong and durable carrying case with ample room for spare reels, lenses, etc.

13 and 14 GT. CASTLE STREET
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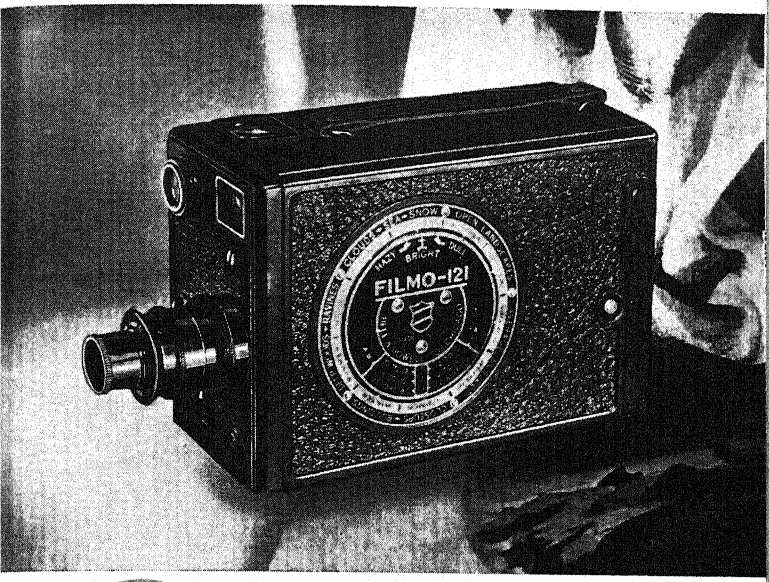
16mm.
70 D.A
70 E

FILMO CAMERAS

In the 70 DA, the cinematographer has an exceptionally versatile instrument. Accommodating 3 lenses in its turret, it swings special purpose lenses into operation instantly. Its standard equipment is a Taylor Hobson F/2.7 focusing lens, fully colour corrected for modern fast panchromatic emulsions and for Kodachrome. Seven speeds permit a slowing down of too rapidly moving subjects or speeding up sluggish action—as well as real slow motion. A critical focuser ensures hair sharp images. And a hand crank permits single frames, lap dissolves and the continuance of important scenes without breaking the sequence to wind the motor.

Filmo 70 E has 4 speeds and is fitted with a fast F/1.5 lens, so is eminently suitable for indoor movies, where the light is poor, and also for slow motion outdoors and Kodachrome. The lens can be instantly changed to a telephoto or other special purpose lens. The 70 E is an admirable camera for all-round high-class cinematography—appealing to those who want the best but do not wish to go to the expense of all the refinements included in the 70 DA.

BELL & HOWELL



16mm. MODEL 121 FILMO CAMERA

Real enjoyment from a movie camera, comes in the smooth working of a watch-fine mechanism. In the results that a truly fine lens gives. In theatre quality movies in colour or black and white. Such a camera is Filmo 121.

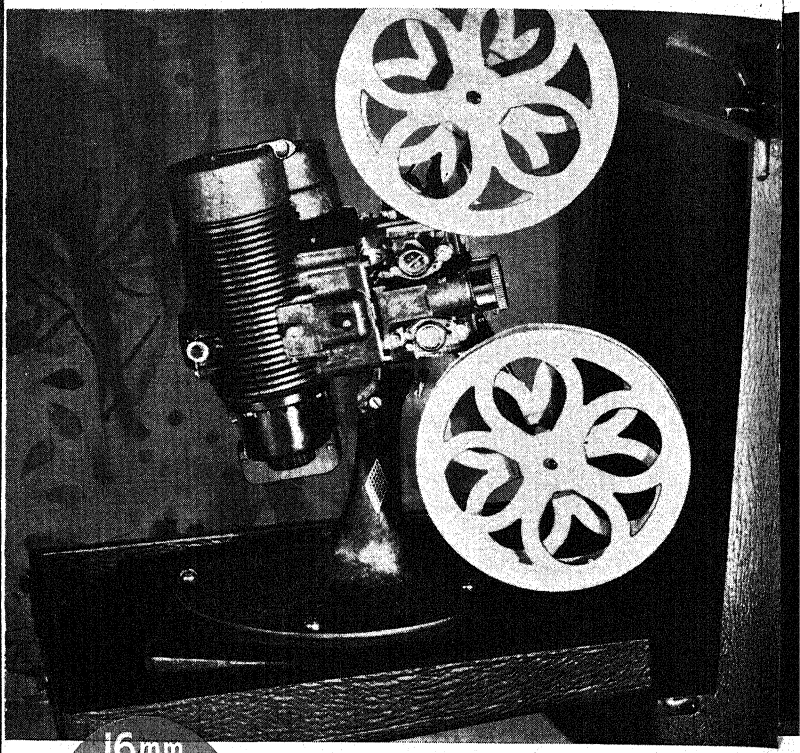
Instant Magazine loading, an invaluable asset for changing over from colour film to black and white without wastage of film. The 121 is light in weight and very compact, only 5½ inches long. Built in exposure guide, both eye and waist level view-finders. The view-finders are very close to the lens—thereby minimising parallax and guaranteeing that what you see you get. The fast F/1.5 lens—fastest in any amateur movie camera —gives movies of the highest perfection ; instantly interchangeable with special purpose lenses—making the 121 really versatile.

Taylor Hobson Lenses are fitted as standard equipment to all Filmo cameras.

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16mm. ST AND SU

FILMO PROJECTORS

One reason for the long life and constant dependability of Filmo Projectors is that they are easier to maintain in first-class condition.

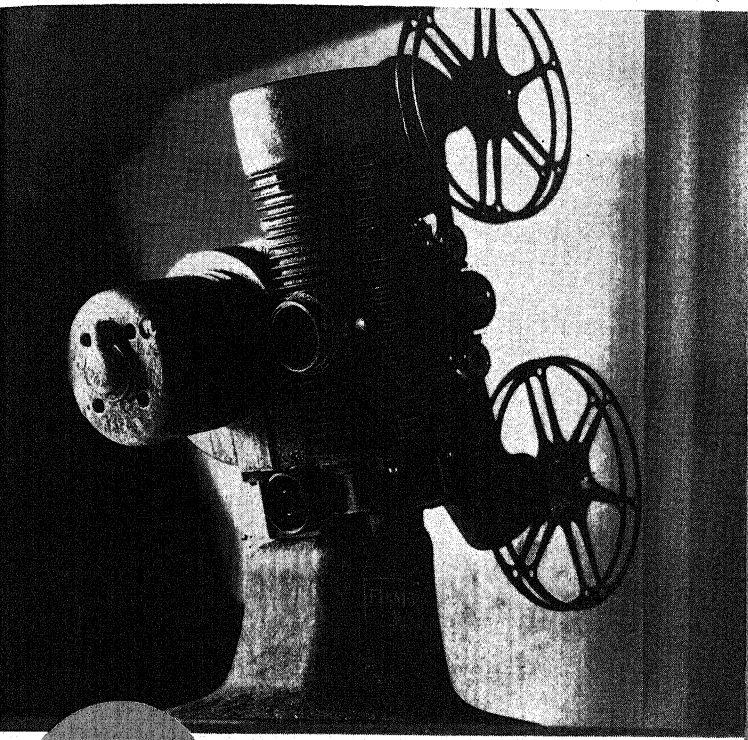
Take lubrication, for instance. In these projectors, metered lubrication supplies exactly the right amount of oil—no more, no less—to moving parts. Motor bearings have their lubricant permanently sealed in, and require no attention from the operator.

The optical system is instantly accessible for cleaning—without tools or lost time. Lamps are replaced in a moment, even while hot, without tools or gloves.

These and many other mechanical refinements make Bell & Howell Projectors preferred in schools and institutes, where projectors must be constantly dependable, and must give rock-steady, uniformly brilliant, flickerless movies at the lowest possible cost per year.

Coupled with this dependability is the comparatively low initial cost of Filmo SU and ST Projectors.

BELL & HOWELL



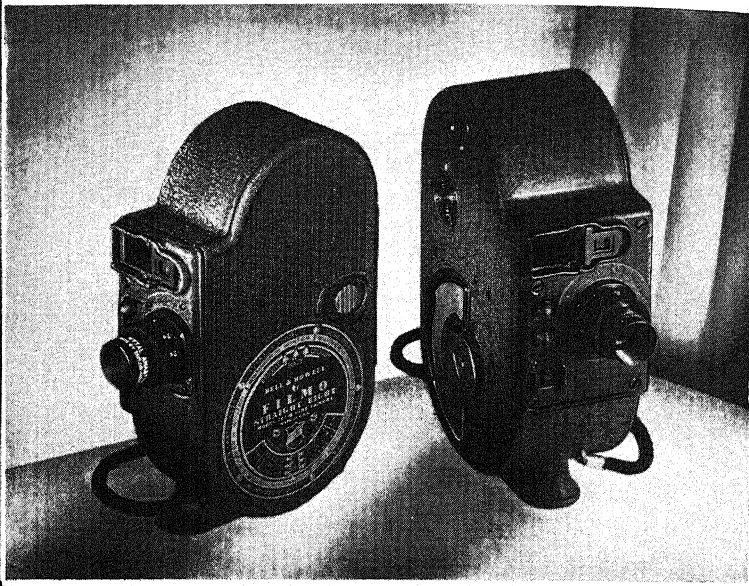
8mm. FILMO PROJECTOR

The accumulated experience of nearly 30 years studio camera and equipment manufacture enabled Bell & Howell to set the standard for cine apparatus, and the 8mm. Filmo is already one of the most popular projectors. Its brilliant flickerless pictures with a uniform "coverage" of illumination are features comparable with the professional entertainment, save only in size. A 6 ft. screen is advocated for the 1 in. F/1.6 exceptionally fast lens. Film is protected by wear by recessed precision mechanism and from heat by the tornado cooling fan aero-type heat dissipating fins. Edge tension and rectangular shuttle tooth movement, with large sprockets for easy threading and professional locking sprocket guards are features that ensure efficiency in operation. A pilot light is also embodied, as is a fully adjustable tilt and a manual framer. The 8mm. Filmo is not belt or chain driven, the transmission being a positive gear device.
The automatic safety shutter makes "still" projection possible, the capacity is 200 ft. of 8mm. film. Sturdy carrying case with room for extra reels.

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STRAIGHT EIGHT AND DOUBLE EIGHT

FILMO CAMERAS

The world's smallest movie cameras — possess the precision of the finest made watch. Fit into the palm of one hand . . . snuggle unobtrusively into your pocket . . . and make the finest, clearest, most brilliant movies. The Double Eight uses the low cost double-run 8mm. film, reducing the cost of film by more than half. Loading is the easiest ever—just drop in the film—literally nothing else—no sprockets to thread—no loops to form.

Sight through the enclosed spy glass view-finders to get on the film exactly what you see in the finder. Superb Taylor Hobson F/2.5 lens instantly interchangeable with fast and telephoto lenses. Four accurately regulated speeds, including slow motion. Built in exposure calculator. Straight Eight handsomely finished in dark brown crystalline, and the Double Eight in a dark grey. Filmo Straight Eight is exactly similar to the Double Eight except that it uses 8mm film.

BELL & HOWELL CO. LTD.
13 and 14 GT. CASTLE STREET
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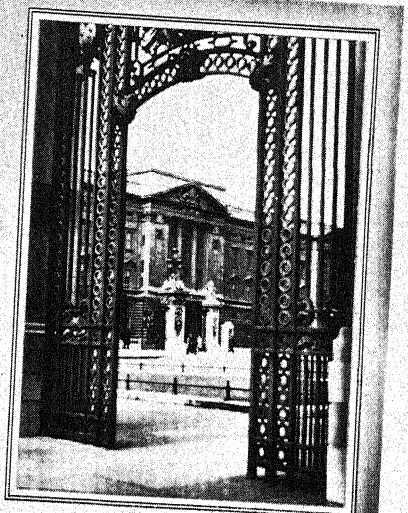
Agfa

Isochrom

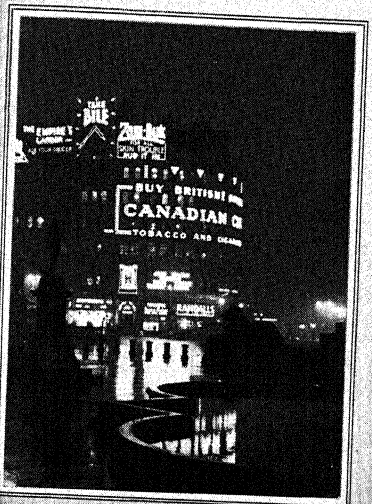
The first marketed 'chrome' film that still leads in speed, quality and reliability.

Brilliant pictures are easily obtained in dull, as well as in fine weather.





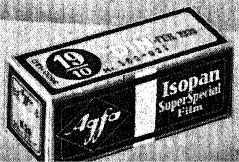
FOR YOUR CORONATION SNAPS



Agfa

Isopan ISS

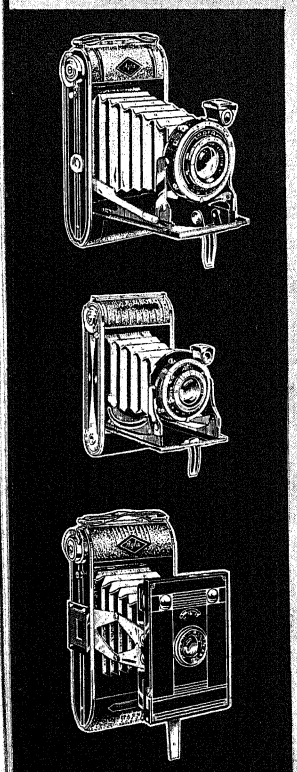
A panchromatic film giving correct tone rendering with a fine grain emulsion. The Isopan ISS is eminently fitted for all photography by half-watt lighting in the home, street scenes at night, floodlit buildings, and illuminated decorations.



Agfa

FOR YOUR CORONATION SNAPS





SPEEDEX COMPUR

A compact camera with all the latest devices to satisfy the discriminating photographer. Strongly made and handsomely finished. Lens f/4.5 Anastigmat. Compur Shutter. Two view-finders. Easy loading. Takes roll films 3¼" x 2¼" (Agfa B.20).

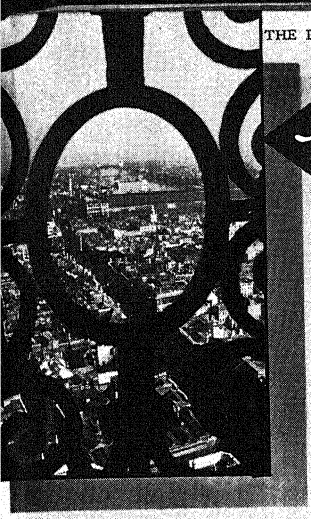
SPEEDEX O

A neat little camera for the pocket or handbag. Takes roll films 2½" x 1⅝" (Agfa A.27). Lens f/3.9 Anastigmat. Compur Shutter. Two view-finders. Simple loading

SPEEDEX CLACK

Two attractive models of sturdy construction. Easy to handle. Excellent definition. Moderate in price.

Model 51 — 16 exposures on B.20 roll film (2¼" x 3¼")
Model 74 — 8 „ „ „ (2¼" x 3¼")



Agfa

FOR YOUR CORONATION SNAPS

Miniature Cameras such as Leica, Contax, Rolleikin, etc., will be much in evidence during the Coronation pageantry. There is a comprehensive range of 35 mm. Agfa films available for these cameras, giving dependable results under all conditions.

Film	For use in	Enlargements
Isochrom FF 10/10 DIN.	Favourable daylight.	Of greatest diameter.
Isochrom F 16/10 DIN.	All weathers.	Of normal diameter.
Isopan FF 10/10 DIN.	Favourable daylight.	Of greatest diameter.
Isopan F 17/10 DIN.	All weathers.	Of considerable diameter.
Isopan ISS 20/10 DIN.	Daylight and Artificial light.	Of normal diameter.
Ultra Color.	For natural colours.	

BROVIRA

The Bromide paper *par excellence* for enlargements, particularly from miniature negatives. Brovira is obtainable in many different surfaces to suit every negative and each individual taste.

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FOR YOUR CORONATION CINE-PHOTOS

16mm. REVERSIBLE FILMS

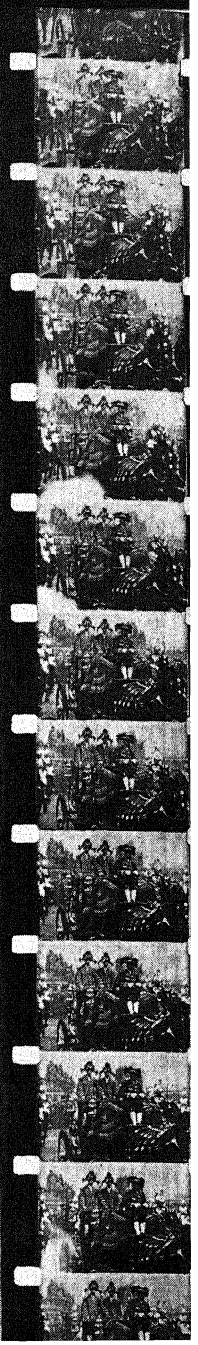
AGFA PANCHROMATIC FILM

combines speed with fine grain and brilliancy with latitude. Suitable alike for indoor and out-of-door subjects in daylight, it gives true and lifelike reproduction.

AGFA ISOPAN ISS

embodies the same qualities, but is still faster and possesses an increased sensitivity to red. This quality makes Isopan ISS eminently suitable for all subjects in artificial light and where the light conditions are insufficient for the Panchromatic Film.





EXAKTA

A Real Reflex

No Parallax



24 × 36 mm. 1½ × 1 in.

4 × 6,5 cm. 2½ × 1⅝ in.

EXAKTA

24 × 36 mm.

1½ × 1 in.

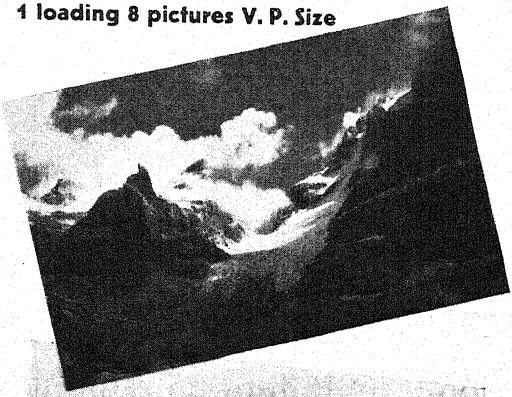


For serial pictures.
36 pictures
at one loading
of 35 mm. film.

Reliable • Elegant
For every purpose

1 loading 8 pictures V. P. Size

Double exposures impossible as the changing of the film automatically sets the shutter. Absolutely free from parallax. Self-capping focal plane shutter for exposures from $^1/_{1000}$th to 12 sec. Delayed action release. Interchangeable lenses (lenses of large aperture to F/1.9, telephoto and wide angle lenses). Special devices for flashlight and microscopical photography and many other purposes.







EXAKTA

4 × 6 1/2 cm.

2 1/2 × 1 5/8 in.



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EXAKTA *makes*

at ten inches

with extension tubes





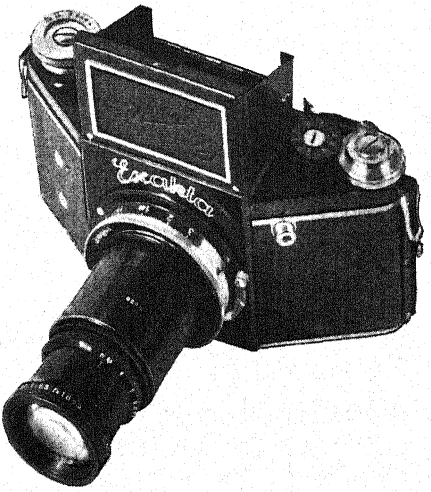
EXAKTA

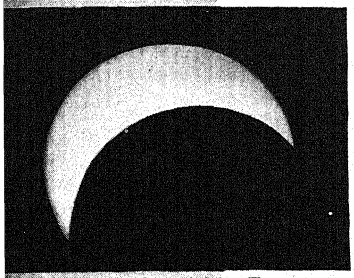
with extension tube

hotographs

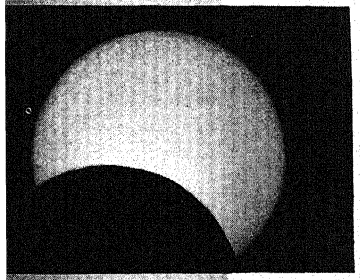
miles away

telephoto lenses

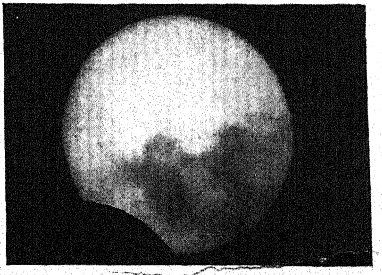




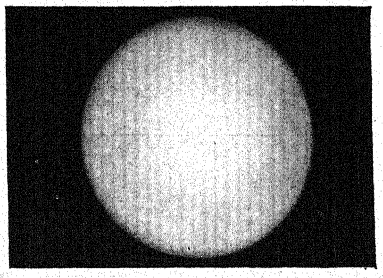
5 h., 10 min. AM, Exposure th sec.



5 h., 34 min. AM, Exposure th sec.



Time 5 h., 54 min. AM, Exposure $^{1}/_{1000}$ th sec.

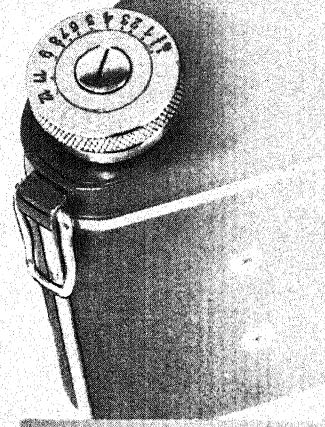


Time 6 h., 0 min., 10 sec. AM, Exposure $^{1}/_{1000}$ th sec.

e **EXAKTA** *even at Eclipse of the Sun!*

e photographs taken by Dr. io Zippermayr, Vienna during latest eclipse of the sun on e 19th 1936 at the Astro- ical Observatory

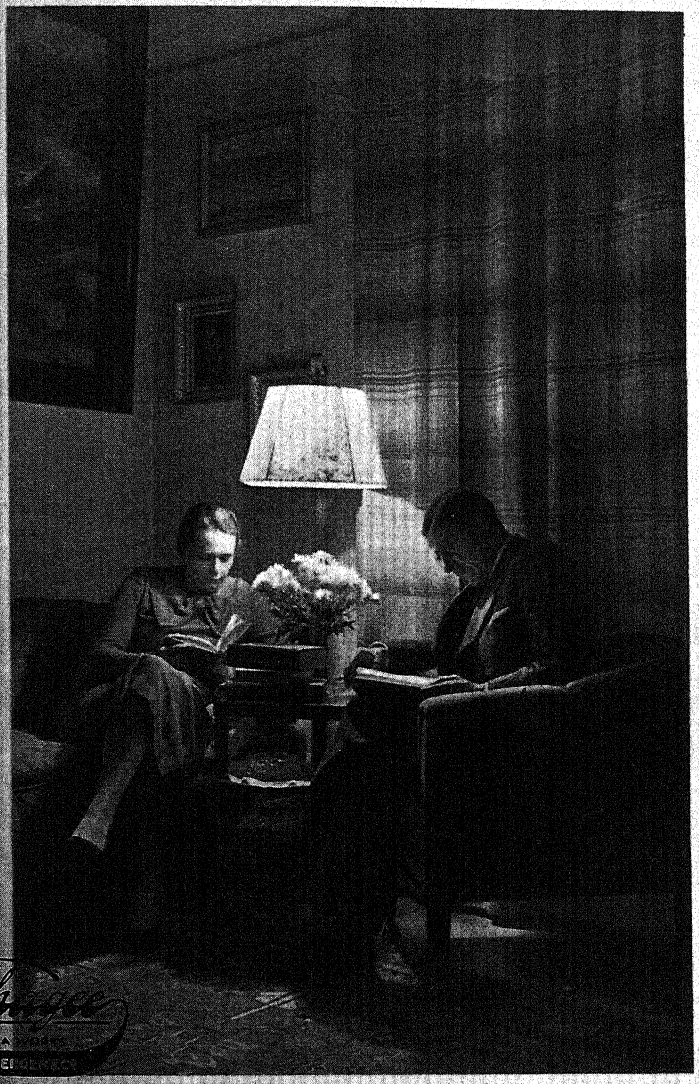
EXAKTA *for day*



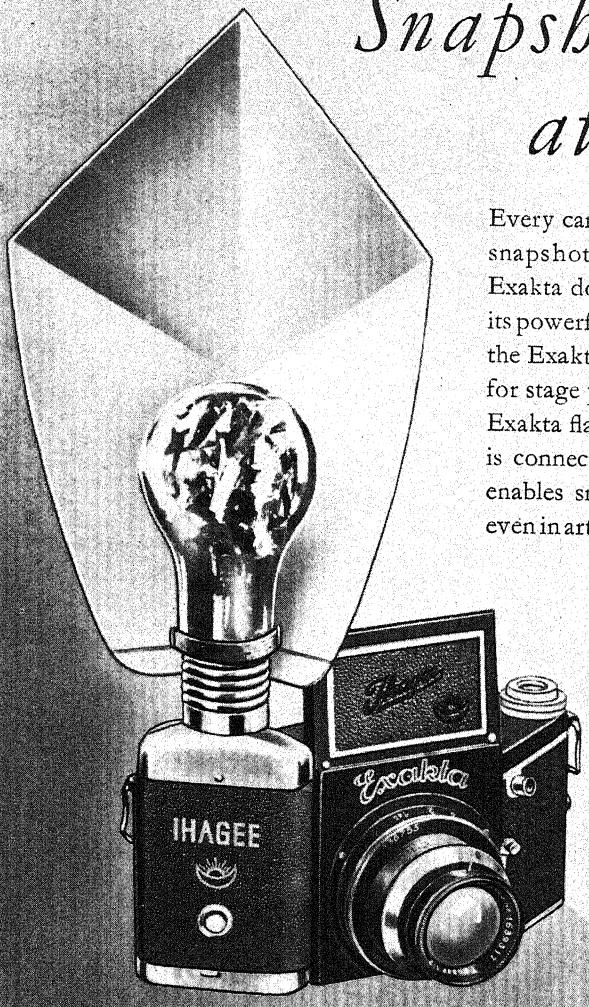
The wonderful Exakta shutter is the World's only one, which enables exposures from $^{1}/_{1000}$th to 12 seconds or from $^{1}/_{1000}$th to 6 seconds with the delayed action release. Highest speeds for sports, slow speeds for artistic still-life. Night photography at home with artificial light is far from being difficult, as the Exakta needs no flashlight, and the delayed action release permits to make photographs of one's self without the use of special photos lamps or reflectors.



nd night



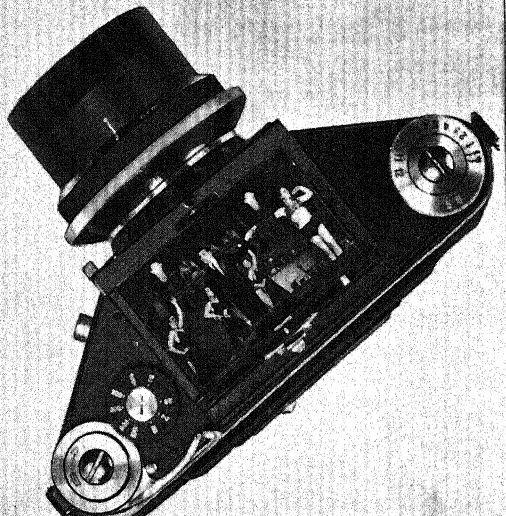
Snapshots at Night



Every camera can be used for snapshots in sunlight. The Exakta does more! Thanks to its powerful lenses up to F/1.9, the Exakta is the ideal camera for stage photography and the Exakta flashlight outfit, which is connected with the shutter, enables snapshots to be made even in artificially lighted halls.

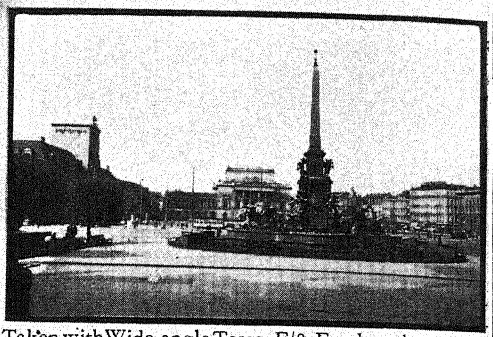


Snap your stars with **EXAKTA**

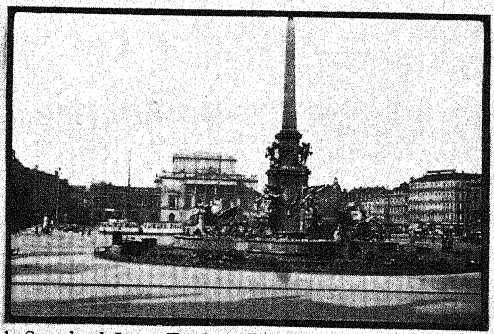


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Taken with Wide-angle Tessar F/8, Foc. length 5,5 cm.



Taken with Standard Lens Exaktar F/3.5, Foc. length 7,5 cm.

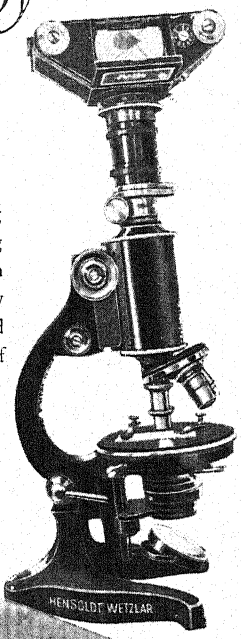


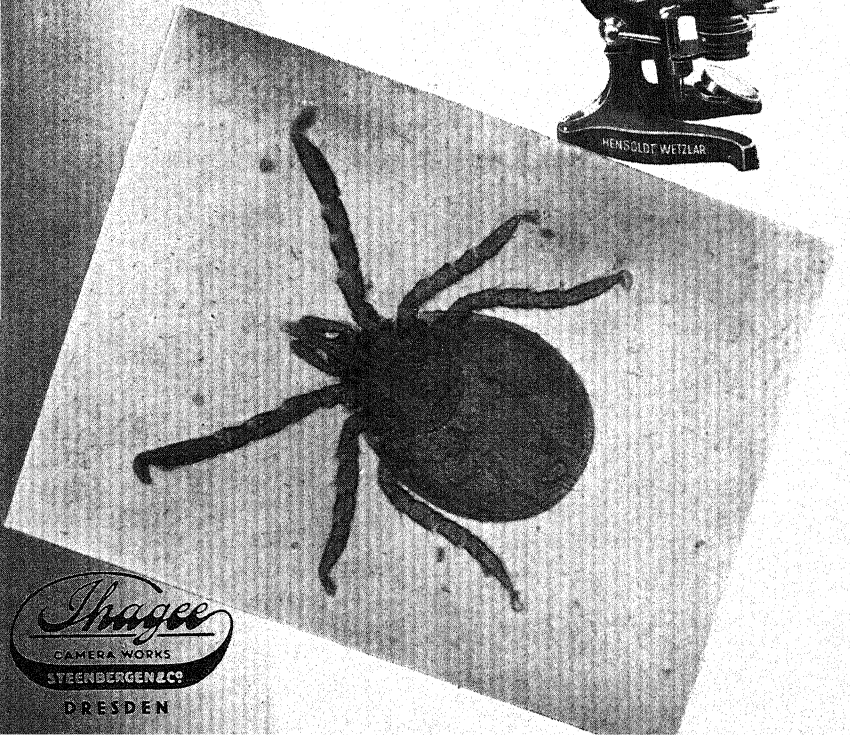
Taken with Tele Megor F/

The possibility of interchanging the lens even while the camera is loaded makes the Exakta suitable for all photographic purposes. Lenses of various focal distances (Telephoto lenses to 25 cms.), of various angles (Wide angle lenses to 66°) and of various apertures (Night lenses to F/1.9) give to amateurs as well as professional photographers a range of every possible usefulness.

Microscopical photography with the EXAKTA

The Exakta conquers this sphere of usefulness thanks to its being *a real reflex-camera with only one lens*. The ground-glass enables one to control the image, even for moving subjects, until the exposure is made and ensures obtaining the correct image, as the Exakta is completely free from parallax. The Exakta is attached to the microscope by means of the Micro-Adapter, which can be turned over at right angles thus permitting the interchange of the oculars. A very practical and simple device!

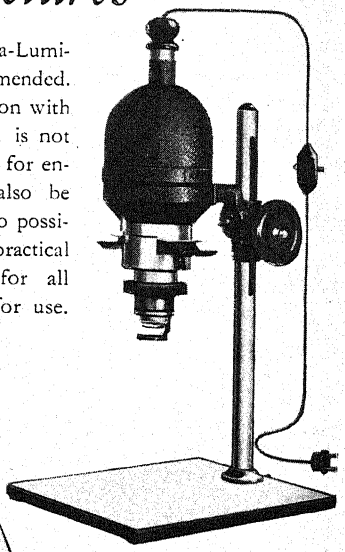


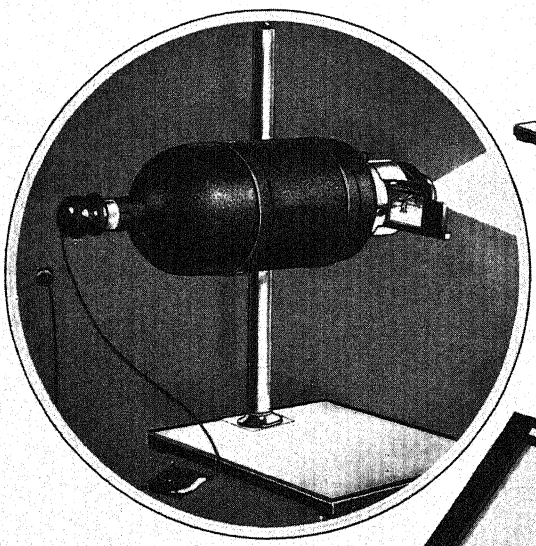


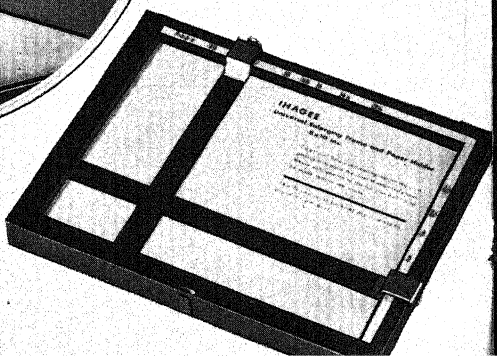
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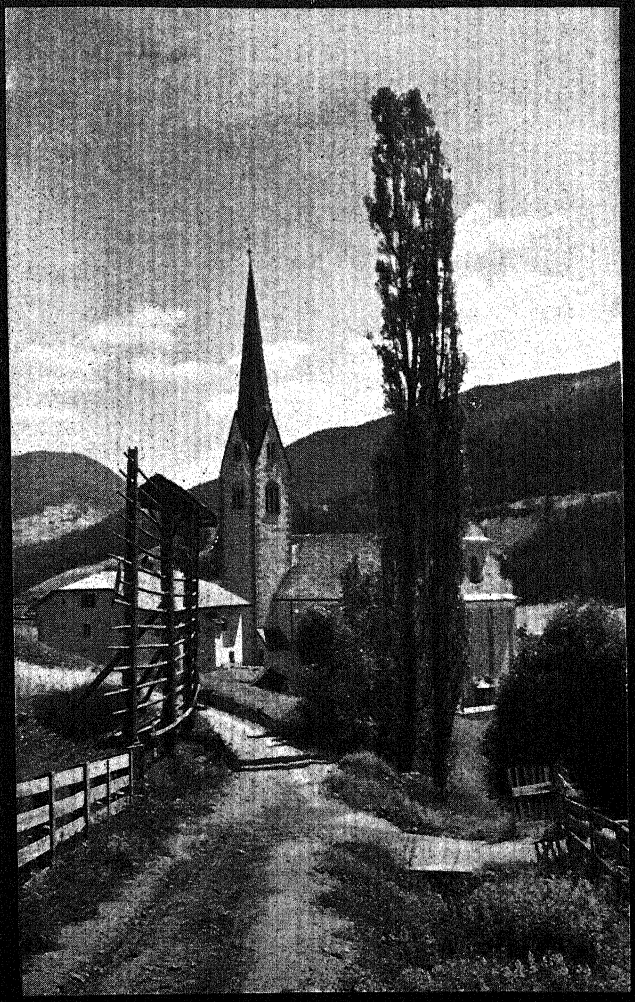
Enlargers for EXAKTA *pictures*

For enlarging Exakta negatives the Exakta-Lumimax or the Projection-Lumimax are recommended. Either apparatus may be used in conjunction with the high class lens of the Exakta and it is not necessary to purchase another special lens for enlarging. The Projection-Lumimax may also be used for home projection thus giving two possibilities in one apparatus. One of the practical Universal Enlarging frames, adjustable for all smaller sizes, is strongly recommended for use.

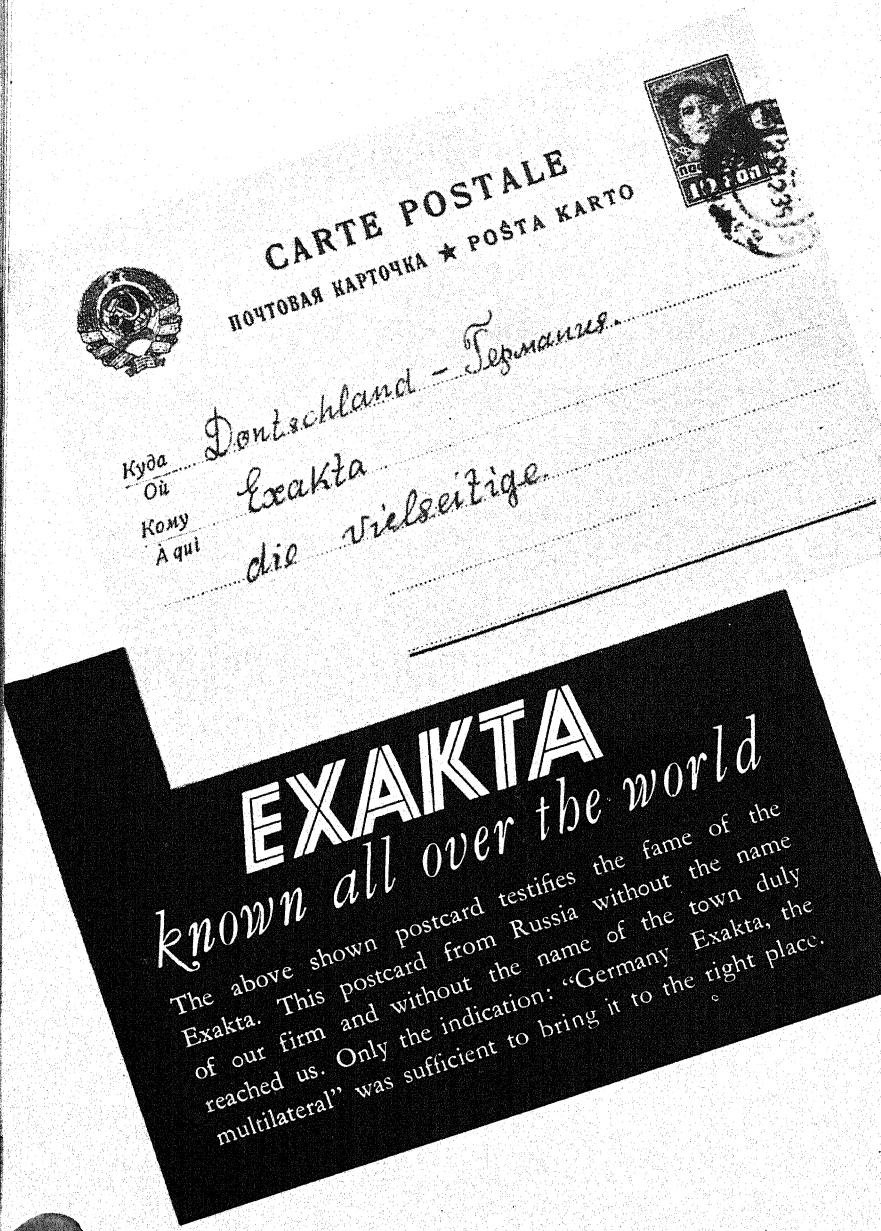






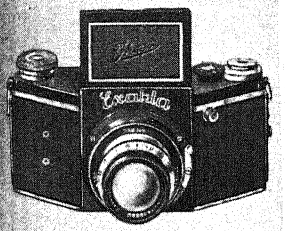


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CARTE POSTALE
ПОЧТОВАЯ КАРТОЧКА ★ POŜTA KARTO
Куда
Où
Dontschland – Германия.
Кому
À qui
Exakta
clio vielseitige.
EXAKTA
known all over the world
The above shown postcard testifies the fame of the Exakta. This postcard from Russia without the name of our firm and without the name of the town duly reached us. Only the indication: "Germany Exakta, the multilateral" was sufficient to bring it to the right place.

EXAKTA

Handbook



by G. Isert

The author gives a very interesting dissertation upon all points, which the Exakta amateur ought to know about his Exakta. This book is of greatest importance to every owner of an Exakta.

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EXAKTA *and World Opinion*

(TESTIMONIALS . . .)

Kiaochow Tsinan Railway Administration Head Office

Tsingtao, October 11th, 1935

Gentlemen, I take pleasure in stating that the EXAKTA cameras purchased by myself and my friends are giving satisfaction. The camera body is well built, strong and sturdy. The shutter speeds are accurate, and the versatility of both the instantaneous and slow speeds is a great convenience not usually found on other high priced cameras. Easy focussing, upright reflected image, elimination of parallax, focal plane shutter and variable finder are some of the features that appeal to the camera user. I shall be glad to recommend the EXAKTA to any one desiring a good camera.

Buffalo Broadcasting Corporation "The Voice of Buffalo"

Buffalo, N.Y., February 12th, 1936

Gentlemen, I wish to congratulate you for producing what I think is the finest camera on the market. Six months ago I purchased an Ihagee EXAKTA camera with an F/2.8 Tessar lens. I have used this camera for all kinds of photographic work, landscapes, portraits, candid shots, scientific pictures of radio phenomena and equipment, semi-microscopic pictures using the extension tubes, etc., under all kinds of light conditions. The results obtained make me very enthusiastic about this camera. The fact that one can look in the mirror and see exactly the results to be expected in the finished picture is a wonderful help. The extreme range of the focal plane shutter speed values from 12 seconds to $^1/_{1000}$ of a second is an example of the fine precision workmanship with which all parts of this camera are constructed. I can highly recommend this to any one wanting an all around light weight camera.

Photography Gerald Leslie Wilson

Earlsdon-Coventry, 10. 4. 1936

Dear Sirs! This is a somewhat belated acknowledgement of the arrival of the EXAKTA camera outfit, ordered by me, which arrived a couple of weeks ago. I have now had the opportunity of making some three or four dozen exposures in a variety of conditions and with subjects varying from figure work in the studio to Sussex seascapes in the rain. I may say that I find the camera delightful to work with and the results are very satisfactory, I have handled most sorts of cameras at one time or another, but never one more convenient and unobtrusive in use. The shape of the camera, position of the shutter release, focussing manipulation, changing of the film, and the universal finder feature, are all admirable, and to have all these in addition to the important advantage of interchangeable lenses in a reflex camera of the size of the EXAKTA is something for which one should be duly grateful.

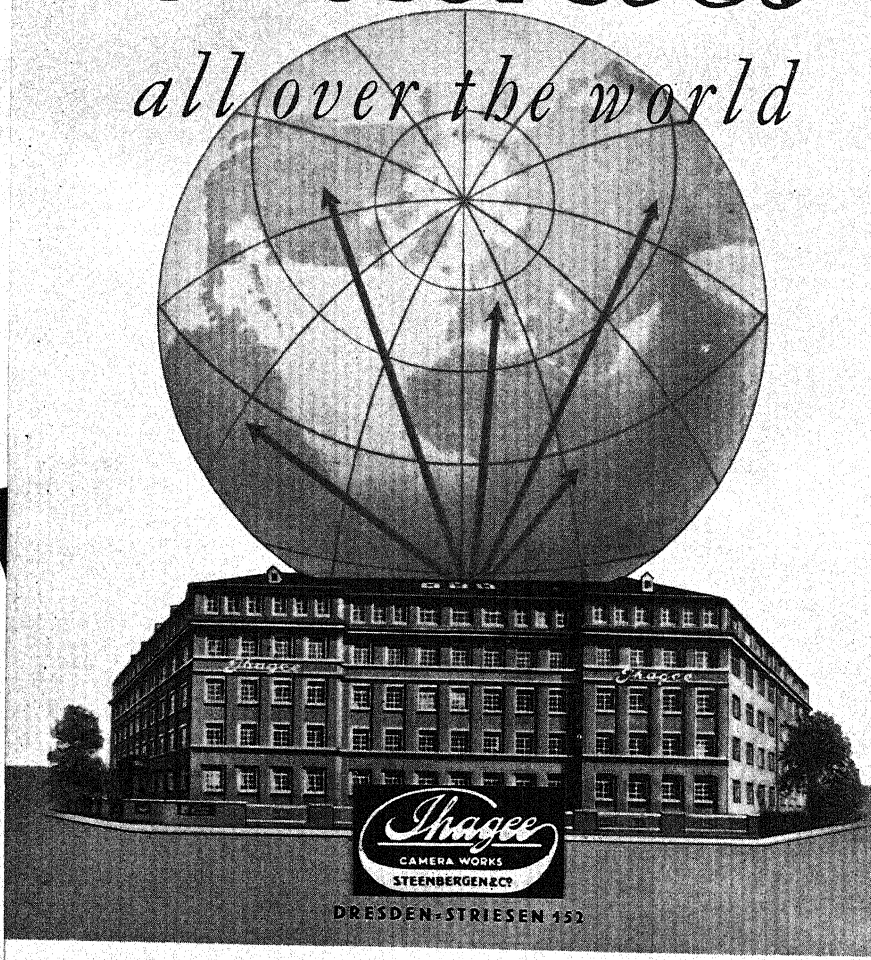
D. A. W.

Zürich 10, (Schweiz), Juni 3/36.

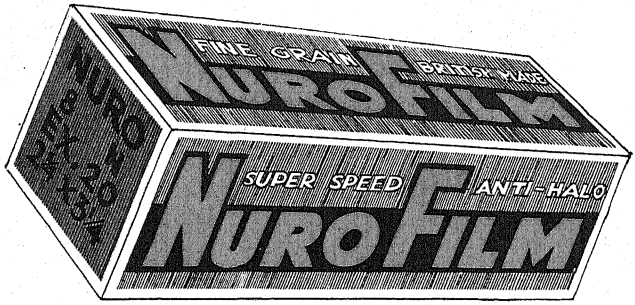
Dear Sirs! I bought, EXAKTA Camera nr. 422978, catalogue nr. 8150, equipped with Xenar 2.9 nr. 679255. I would appreciate your registering this camera in my name. Since purchasing it, I have travelled through France and England and it accompanies me on my tours in Switzerland. The camera has withstood all the unavoidable rough-handling due to travelling and has never failed me. I am very much pleased with it.

Exakta

all over the world



Agents for Great Britain: Garner & Jones, Ltd.
Polebrook House, Golden Square, London-W. 1





Introducing...

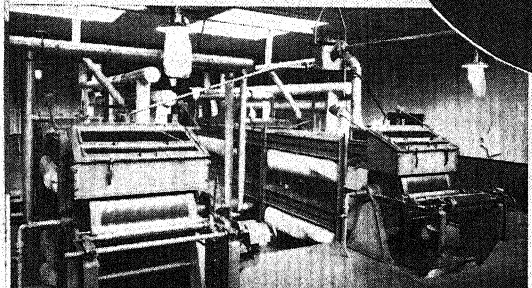
NURO the new all British **FILM**



NURO, the latest, fastest, most sensitive and only all-British roll film, has already proved its popularity in one short season.



One of the laboratories in which NURO perfection is guarded and maintained by a staff of highly-trained experts, ensuring that every film reaching the customer will offer him maximum possibility of photographic success.



The Celluloid Casting Machines,—the first of their kind to be installed in this country ; NURO Film is the first roll film to have its celluloid base produced in England

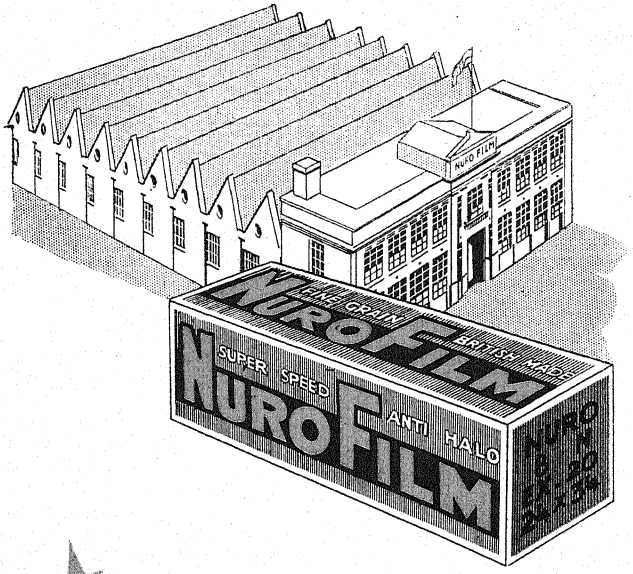
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1936 has proved the success of the boldest pioneer enterprise in the roll film industry. Amateurs have shown their preference for Nuro Film—all-British and certainly better. " Lastic Latitude " is the special feature which makes allowance for amateur errors in exposure. Nothing succeeds like success—from 1937 onwards Nuro Film will be in ever greater demand.



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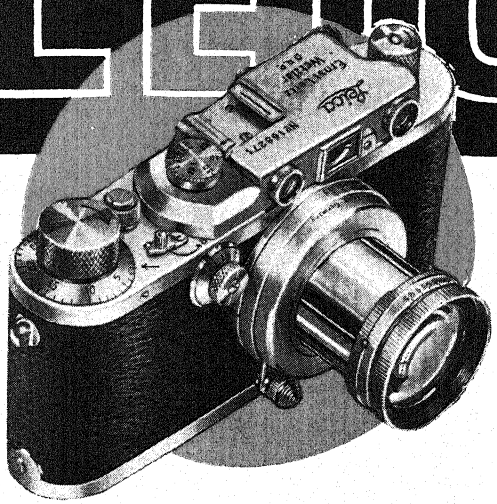
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LEICA



THE CAMERA THAT REVOLUTIONISED PHOTOGRAPHY

From the first the Leica broke completely with tradition, although its designer, Oskar Barnack, had no intention of revolutionising photography. It was a clever man's desire for an instrument to test 35 mm stock, which induced him to design this epoch-making camera.

Undaunted by stubborn opposition on all sides, Barnack never lost faith in his idea. It was Dr. E. Leitz who, with an amazing intuition for inherent soundness of design, saw that the camera was made available to the public, and over 75 years' experience in the manufacture of precision microscopes made possible on this scale the realisation of such a precision instrument. Dealers and public were impressed by the Leica's meticulous craftsmanship and as its enormous potentialities became apparent, there took place an unmistakable change in the trend of camera design generally.

It is not always easy to discern the underlying causes of the success of one product against the failure of an apparently similar article. But public fancy is not so whimsical, it has a knack of recognising the subtle points of superiority between an original product and its followers : they never quite seem to get there.

So well conceived were the original Leicas that, 11 years after, the same fundamental design is embodied in to-day's models with their up-to-date refinements and improvements.

Like the Rolls Royce, so does the Leica camera mean something more than a piece of mechanism to its owner.

IN THE LEICA, TOO, "PERSONALITY" IS THE KEYNOTE OF SUCCESS

PIONEER IN 1925—STILL LEADING

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LEICA

STANDARD LEICA

Focal plane shutter coupled to the film winding mechanism and speeded from 1/20th to 1/500th second. Chromium finish. With Elmar F/3.5, 5 cm interchangeable lens. Without coupled rangefinder £18 5 0

Short Base Rangefinder fitting horizontally on to the camera, but not coupled £2 5 0

LEICA MODEL II.

As Standard Leica, but with automatic focusing built-in short base rangefinder working accurately with any of the range of interchangeable Leica lenses, except the 20 cm Telyt £27 17 0

LEICA MODEL III.

As Model II, but with shutter speeded from 1 to 1/500th second and variable telescopic magnification of the rangefinder £31 16 0

LEICA MODEL IIIa.

Identical to Model III, except that the shutter has an additional speed of 1/1,000th second £34 0 0

All the above Cameras can be supplied as an alternative with the F/2, 5 cm Summar Lens, the increase in price amounting to £9 0 0

Our Cameras are all supplied in chromium finish but, if desired, a black and chromium finish can be obtained to special order for the Standard Leica and Models II and III, the reduction in price being 10 0

NEW RAPID WINDING DEVICE

which consists of a new camera lid and trigger, will fit any of the Leica Cameras and enables pictures to be taken at the rate of two per second ... ... Scnoochrom £3 14 6

OPTICAL NEAR FOCUSING DEVICE

works with any Leica camera having a coupled rangefinder, and enables focusing to be carried out from distances of 17½ ins. to 3 ft. 6 ins. from the object. A parallax compensation to the viewfinder is incorporated.

For 5 cm Elmar lens ... ... Nookychrom £5 14 6

For 5 cm Summar lens ... ... Nookyhesumchrom £5 14 6

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THE INTERCHANGEABLE LEICA LENSES



Leitz Hektor F/6.3, 2.8 cm. Ultra-wide angle. Angle 76° ... ... Hoopychrom £10 18 6

Leitz Elmar, F/3.5, 3.5 cm. Wide angle lens. Angle 65° ... ... Ekurzchrom £9 5 0

Leitz Elmar F/3.5, 5 cm. Standard lens. Angle 48° Elmarchrom £8 14 0

Leitz Summar F/2, 5 cm. Wide aperture and universal lens. Angle 48° ... ... Sumuschrom £17 14 0

Leitz Hektor F/1.9, 7.3 cm. Ultra wide aperture and long focus lens. Angle 34° ... ... Hegra £29 5 0

Leitz Elmar F/4, 9 cm. Universal long focus lens, especially suited to portraiture. Angle 27° ... Elang £11 17 0

Leitz Thambar F/2.2, 9 cm. Soft focus lens with controllable diffusion. Angle 27° ... ... Toody £21 19 0

Leitz Elmar F/6.3, 10.5 cm. Light weight long focus lens. Especially suited for mountaineers. Angle 24° Elzen £10 3 0

Leitz Hektor F/4.5, 13.5 cm. All-purpose long focus lens. Also suited to portraiture. Angle 19° Hefar £18 12 0

Leitz Telyt F/4.5, 20 cm. Telephoto lens incorporating a reflex focusing system. Angle 12° ... Toolp £37 16 0

Leitz Hektor F/4.5, 13.5 cm, in shortened mount for reflex housing of Telyt. Angle 19° ... ... Ohebo £16 6 6

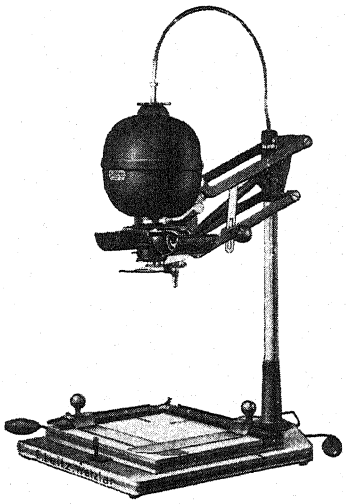
Intermediate mount for adapting lens OHEBO for use with coupled rangefinder as HEFAR... ... Zooke £4 17 0

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LEICA

ENLARGERS

Are designed and manufactured with the same care and precision as the Leica Camera and possess many unique features which make them supreme. The source of illumination is a 75 watt opal bulb which, in conjunction with a single condenser lens and specially designed film gate, gives enlargements of maximum detail with freedom from blemishes. A standard screw thread allows the use of 5 cm camera lenses.



FOR LEICA NEGATIVES.

VALOY visual focusing enlarger with 20 in. upright, without lens		£9	11 6
Printing Board for sizes up to 10 ins. × 8 ins.	Feluk	£3	12 0

FOCOMAT I.

Fully automatic enlargements from 2 to 10 diameters, with special clamping mechanism for the printing board	Viwoo	£16	6 6
Printing Board for sizes up to 10 ins. × 8 ins.	Fpyoo	£4	1 0

FOR LARGER NEGATIVES UP TO $2\frac{1}{2}$ ins. × $3\frac{1}{2}$ ins.

VYBOO visual focusing enlarger with 34 ins. upright and interchangeable F/4, 9.5 cm Elmar enlarging lens ...	Vyboo	£32	19 0

FOCOMAT II.

Fully automatic enlargements with either the 5 cm lens for miniature negatives or 9.5 cm lens for larger sizes. With interchangeable F/4, 9.5 cm Elmar enlarging lens ...	Voowi	£50	12 6
A 5 cm F/3.5 lens for use with any of the above Enlargers can be supplied	Varob	£5	12 6
For enlargement on to chloro-bromide or gaslight papers we can supply special high power illuminants giving up to 10 times the intensity of the 75 watt opal bulb. Prices on application.			
Device for correcting negative distortion due to camera tilt. For VALOY and FOCOMAT I, only	Zrioo	£2	16 6
Wedge-shaped bracket for tilting Printing Board for use with correcting device ZRIOO	Vekip		4 6

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See following pages for details.

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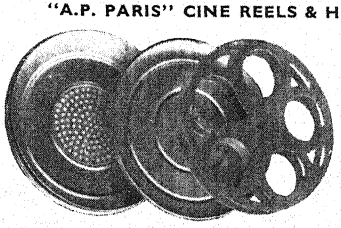
"A.P. PARIS" METAL DARK SLIDES AND FILM PACK ADAPTERS

Equal to any slides on the market. Main fittings: T.P., Zeiss, Cameo, Klito, Contessa, Wirgin, Voigtlander, Certo and Block Edge.

Dark Slides—3½ × 2½ **1/4**; ¼-pl. **1/6**; 9 × 12 cm. **2/3**; 5½ × 3½ **2/3**; ¼-pl. **3/11.**

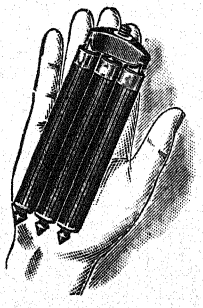
Film Pack Adapters—3½ × 2½ **5/6**; ¼-pl. **6/6.**

"A.P. PARIS" CINE REELS & HUMIDOR TINS



For 8 mm. 9.5 mm. and 16mm. film. Made in duralumin, they are hard-wearing and light. Smooth edges prevent damage to films.

Prices: Reels, 400 ft. 8 mm., 9.5 mm. and 16 mm. **2/3** each. Humidor Tins for above reels, all sizes, **1/3** each. Special 200 ft. 8 mm. Reel and Aluminium Humidor Can, **1/9** Reel, **1/9** Can, complete **3/6.**



TELESCOPIC TRIPODS

4, 5 and 7 section, reversible heads. Prices from **6/6**; particulars free on request.

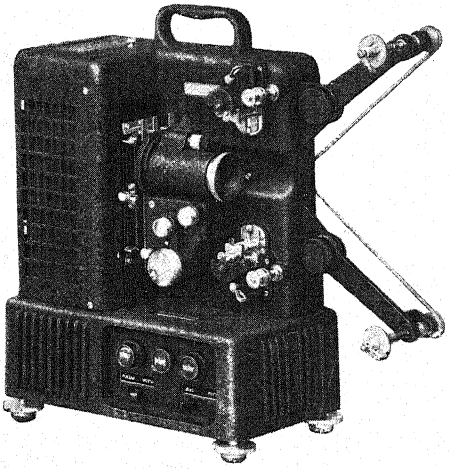
"LILLIPUT" POCKET TRIPOD. As illustrated, 10 sections, duralumin, ribbed covering. 45 ins. high, 7 ins. only closed. Weight 10 ozs. only.

Price 24/- Zipp Case 4/6

Ask your dealer for

"A.P. PARIS" SLIDES, "A.P. PARIS" REELS, ACTINA TRIPODS

DITMAR DUO PROJECTOR



2 Sizes of Film

10 seconds to change

No parts to remove

3 MODELS

9.5/16 mm. 16/8 mm.
9.5/8 mm.

250-WATT MODEL £32 10 0
(Specify lamp voltage.)

500-WATT MODEL 36 0 0
(Complete with resistance.)

From all Cine Dealers

QUICKEST CHANGE-OVER

Twin parallel gates and sprockets, with a sliding lens and lamp-house, ensure a ten-second change of film size. There are no parts to exchange or forget and projection is equally steady on either size.

BRILLIANT, FLICKERLESS PROJECTION

250 or 500-watt lamps with mirror reflector and large condenser, in conjunction with an F/1.6 projection lens, ensure pictures of full brilliance, a three-blade shutter giving flickerless projection.

INTERCHANGEABLE LENSES F/1.6

Normally supplied with the most suitable focal length for general use, but longer or shorter focal lengths are supplied to order.

CLAW FRAMING

Avoids displacement of the picture on the screen when framing.

BUILT-IN PILOT LIGHTS

Illuminated panels in the side of the projector constantly illuminate the film loops and all controls, without interference with the screen picture.

BUILT-IN MOTOR RESISTANCE

This enables the DITMAR DUO to be used as a self-contained unit, without resistance, when 250-watt lamps of mains voltage are used.

STURDY BUILD

The body of the Projector is made from a solid casting of a light but strong alloy. The motor is of unusually large size to provide adequate power. Fibre gears, where possible, are used, ensuring silent running, and maintenance is easy, owing to the accessibility of all working parts.

CONVENIENCE OF OPERATION

All controls are on one panel and provide forward and reverse, "stills," etc. The lamp may be switched off for rewinding, which is done by motor.

The Ditmar Projector combines exclusive improvements with reasonable price.

ACTINA LTD., 29 RED LION SQUARE, HIGH HOLBORN, W.C.1

DITMAR CINE CAMERA

with all the features you have been wanting in a Cine Camera . . . . . .

The DITMAR CINE CAMERA has set the standard for cine cameras of the future. It incorporates so many new features to make filming easier and more certain that the beginner cannot afford to use a less efficient instrument . . . . while the expert can thoroughly appreciate how much difference will be made to his films by the control the DITMAR gives him over his filming. Here are the most important points :—

IRIS SCALE VISIBLE WHILE SHOOTING

Continually in your view-finder you can see your iris scale and . . .

IRIS ADJUSTABLE WHILE SHOOTING

Enabling change to be made instantly should light or subject alter; for fade-outs, etc. or to compensate simultaneously for . . .

CHANGE OF SPEED WHILE SHOOTING

You can switch over from normal to slow motion by pressing one or both of two conveniently placed releases. There is no interruption in the continuity of the film . . . just an immediate increase or decrease of speed, and as stated, iris may be adjusted simultaneously.

NO VERTICAL PARALLAX

The view-finder is on the same level as the lens. The slight and very unimportant horizontal parallax in close-ups is compensated for by a sliding eyepiece. The picture then appears through a tinted screen, acting as a reminder when reverting to normal distances.

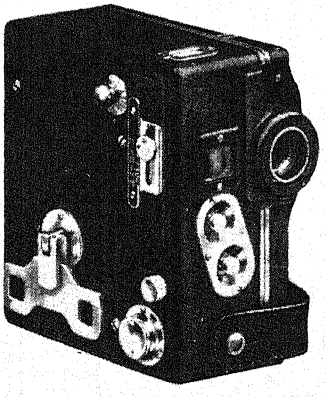
INCORRECT LOADING IMPOSSIBLE

Unless the film is correctly in the gate, and the gate closed, it is impossible to close the camera.

CORRECT DESIGN OF GATE

Assures complete absence of annoying film jamming or scratching at normal and high speeds.

. . . . . ask your dealer, or write for Free Catalogue



The DITMAR Double Compartment Film Charger for 9.5 mm. Film has many advantages. .. Price 5/-

Particulars free upon request.

As befits such a high precision instrument, the DITMAR CINE Camera is beautifully finished in black and chrome (a special model with patent tortoiseshell finish being available at 15/- extra.) Other features, such as SINGLE PICTURES by hand crank, and continuous running are provided. A range of tele and wide angle attachments are available.

9.5 mm. . . . . . for 30 ft. chargers.

with STEINHEIL CASSAR f2.9
fixed focus **£12 12 0**
with Berthiot f2.8 focussing mount **£14 14 0**
with BERTHIOT CINAR f2.8
focussing mount **£16 16 0**

16 mm. . . . . . for 50 ft. spools.

with BERTHIOT CINAR f2.8
fixed focus **£15 15 0**
with Berthiot f2.8 focussing mount **£17 17 0**
with Berthiot f1.8 focussing mount **£22 0 0**
9.5 models 50 ft., similar to 16 mm., same prices.

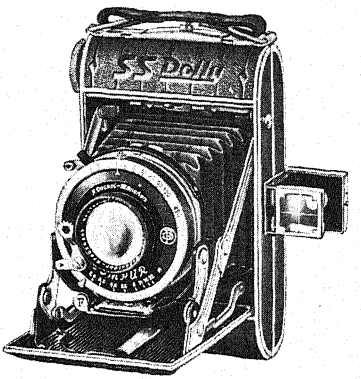
8 mm. . . . . . for 25 ft. double run.

with Berthiot f2.5 fixed focus .. **£14 14 0**
with Berthiot f1.8 fixed focus .. **£16 16 0**
with Berthiot f1.8 focussing mount **£18 18 0**
Tele and wide angle lenses list upon request.

Sole British Concessionaires for R. DITMAR, VIENNA XI, AUSTRIA

Certo Cameras of Distinction

The PLATE-&-ROLL FILM Super-Sport



INTERCHANGEABILITY OF PLATES AND FILMS

The Super Sport C uses standard 2¼ × 3¼ ins. roll films, giving pictures either 2¼ × 2¼ or 2¼ × 1¾ ins. (two appropriate masks provided), also plates 4.5 × 6 cm. Three clip-on slides and focussing screen also included. Film pack adapter available on request.

REVERSE SPOOLING

By its means the film may be rewound to enable lens to be changed or to allow use of plates or change of mask even when film is only part used. Films may also be exchanged—thus allowing colour film, infra red, etc. to be used at will.

12-EXPOSURE DIAL

Is fitted on the top winding key, to ensure correct spacing of 12 pictures 2¼ × 2¼ ins.

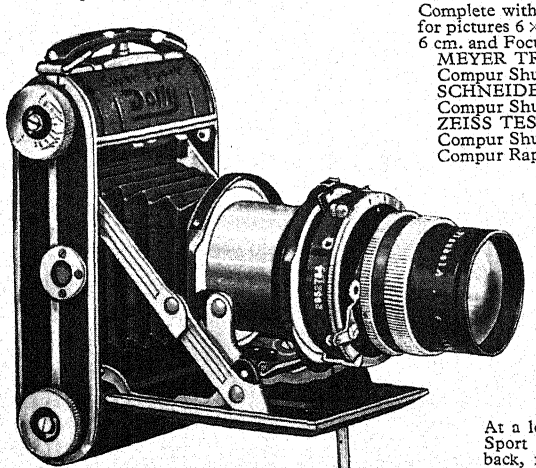
WIDE APERTURE LENSES

See prices (helical focussing lens marked * otherwise front lens focussing).

SUPER-SPORT MODEL C

Complete with 3 Slides, Masks for pictures 6 × 6 cm. and 4.5 × 6 cm. and Focussing Screen :

MEYER TRIOPLAN F/2.9, Compur Shutter	£10	10	0
SCHNEIDER XENAR F/2.9 Compur Shutter	12	17	6
ZEISS TESSAR F/2.8, Compur Shutter	15	17	6
Compur Rapid (1/400th) extra	1	5	0



INTERCHANGEABLE LENS

Lens and shutter unit are held by a simple catch and may be removed for the use of telephoto lens, a Plaubel Tele Makinar of 21 cm. focal length being available.

EXTENSION TUBE FOR CLOSE-UPS

This, fitted between lens and bellows, allows close-ups to be taken.

At a lower price, Model A Super-Sport as above, but without plate back, reverse spooling and removable lens :

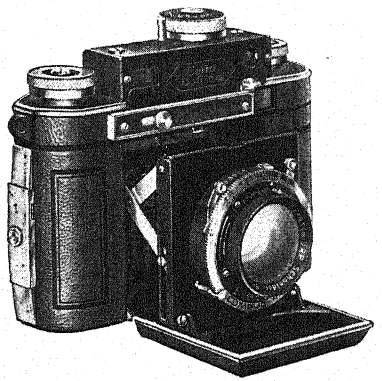
Meyer Trioplan F/2.9, Compur 1/250th ...	£8	15	0

Full Prices upon request.

See them at your dealers or write for complete catalogue.

ACTINA LTD., 29 RED LION SQUARE, HIGH HOLBORN, W.C.1

Coupled Range Finder



Dollina II

The Precision Miniature

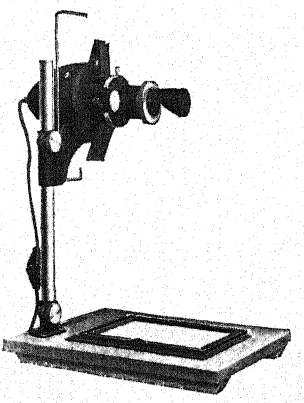
FOR 36 EXPOSURES ON STANDARD CINE FILM

Embodying every desirable feature —sturdy die-cast body, accommodating all 35 mm. films in daylight-loading cassettes; wide aperture lenses in Compur shutters, external focussing by coupled range-finder, with camera either open or closed, tubular built-in view-finder, automatic locking and film-counting device, reverse spooling . . . the DOLLINA II is equally outstanding among precision miniatures for its wonderful specification and its reasonable price.

STOCKED BY ALL HIGH CLASS DEALERS

Steinheil Cassar F/2.9, Compur 1/300th	£12 17 6
With Compur Rapid, 1 to 1/500th sec.	13 7 6
,, Schneider Radionar F/2.9 ..	14 12 6
,, Zeiss Tessar F/2.8	18 18 0
,, Schneider Xenon F/2	19 19 0
Model I, without range finder, with Schneider Radionar F/2.9 and Compur, from	£9 5 0

Certos ENLARGER



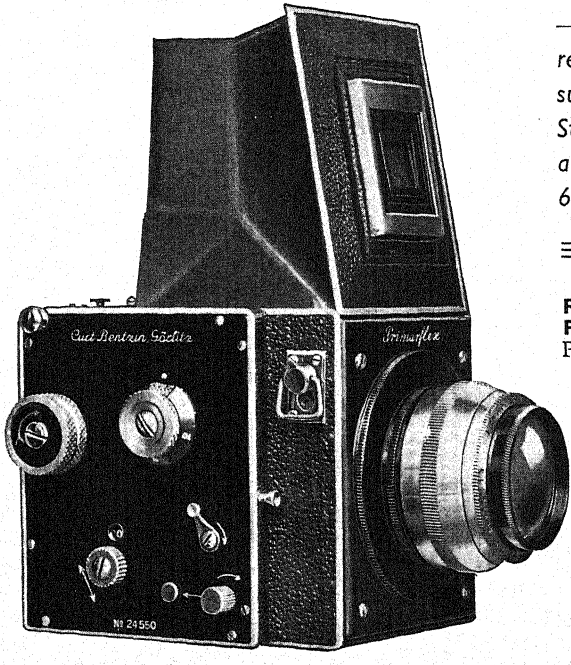
For negatives 36 × 24 cm., 3 × 4 cm. and 4 × 4 cm. The unique enlarger, with paper selector and exposure meter —focussing arrow indicating sharpness and ratio of magnification. Same effect as a 75-watt lighting obtained with a lamp of 25 watts only. Elliptic reflecting glass mirror.

Price .. £8 8 0

Sole British Concessionaires for CERTO CAMERA, WERKE, DRESDEN 46

Sole Australian Distributors—Australian Camera Import Co., Box 2610 G.P.O., Melbourne

BENTZIN PRIMARFLEX



—the fastest working reflex for 12 exposures 6×9 cm., on Standard Roll Film, and 4.5×6 cm. or 6×6 cm. PLATES.

ROLL FILM OR PLATES. The Primarflex permits the use of roll films, standard 2¼×3¼ ins. giving 12 pictures 2¼×2¼ ins., also plates 4.5×6 cm., loaded either horizontal or upright. No alteration of lens position or camera back is necessary when using plates. It is a full reflex when using either plates or films.

FULL RANGE OF SHUTTER SPEEDS 1 to 1/1000th second ON ONE KNOB. BUILT-IN DELAYED ACTION.

Write for Full List of Interchangeable Lenses for the PRIMARFLEX

With MEYER TRIOPLAN F/2.8
10.5 cm., in focussing mount .. **£31 10 0**

With ZEISS TESSAR F/3.5
10 cm., in focussing mount .. **£36 10 0**

Including Shoulder Straps, Release and Plate Slide. (Camera without lens **£20 0 0**).

ACTINA LTD., 29 RED LION SQUARE, HIGH HOLBORN, W.C.1

the camera for the connoisseur . . . .

INTERCHANGEABLE LENSES. A wide range of lenses from 10 to 40 cm. focal length are available and are fitted with mounts to screw immediately into the Primarflex. Helical focussing is standard.

AUTOMATIC FILM AND SHUTTER WIND, COUPLED WITH MIRROR AND COUNTER. A turn of the winding knob until it locks winds on film, sets shutter, depresses mirror and sets number indicator. No numbers to watch, the counting dial being used only to check number of exposures made.

SELF-CAPPING FOCAL PLANE SHUTTER. The most efficient type of shutter possible ; it can be set to any desired speed before or after winding. No vibration at any speed. Change of lens is possible between film exposures.

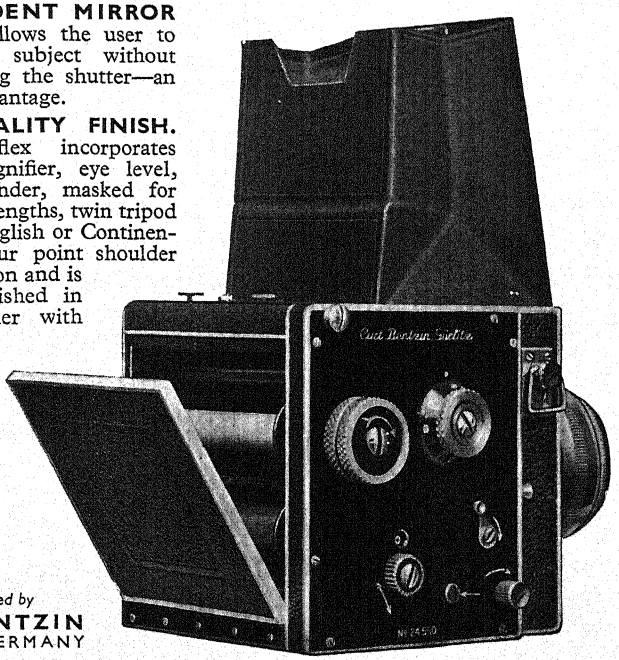
SPEEDS 1 sec. to 1/1000th sec. A full range of speeds (1/2, 1/5, 1/10th, etc.) admits of every type of subject being successfully dealt with . . . sports work to interiors. All speeds on one knob only.

SMOOTH SHUTTER RELEASE. As soon as the release is pressed the mirror lifts quickly and smoothly by means of balanced springs and simultaneously the shutter is operated. There is no jar or shock.

DELAYED ACTION. A delayed action release is built in.

INDEPENDENT MIRROR SET. This allows the user to examine his subject without actually setting the shutter—an important advantage.

HIGH QUALITY FINISH. The Primarflex incorporates focussing magnifier, eye level, direct view-finder, masked for varying focal lengths, twin tripod sockets for English or Continental thread, four point shoulder strap suspension and is beautifully finished in superior leather with polished metal edges to avoid fraying.



See it at your dealers or write to Sole British Concessionaires for details.

Manufactured by
CURT BENTZIN
GORLITZ, GERMANY

SOLE BRITISH CONCESSIONAIRES FOR CURT BENTZIN

BAUCHET

for Quality—Economy—Service

PAPERS & POSTCARDS

"ECLA" BROMIDE

Although a fast bromide paper, the contrast is of the gaslight type. The "Ecla" will therefore give the vigour and brightness required for amateur negatives and any weak negatives resulting from difficult conditions in Press and D. & P. work.

"NORMA" BROMIDE

Norma-Medium. Less contrasty than the "Ecla" and made for use with negatives of normal density and contrast.
Norma-Soft. For negatives on the hard side.
Available in Glossy, Semi-matt, Matt, Single and Double Weight. Cream Matt and Semi-matt in NORMA grade only.

STENOX GASLIGHT

Gives clear, bright prints full of delicate gradations. The Stenox emulsion is remarkable for its blue-black tones and the Stenox base for its pleasing mauve-blue tint. Great latitude.
Glossy only, in Ultra Vigorous, Vigorous, Normal and Soft.

NET PROFESSIONAL PRICES (TRADE CARD TO ACCOMPANY ORDERS)

$3\frac{1}{2} \times 2\frac{1}{2}$ ..	per gross	2/–	
$4\frac{1}{4} \times 3\frac{1}{4}$ ..	,,	3/–	
$6\frac{1}{2} \times 4\frac{3}{4}$ ..	,,	5/9	
$8\frac{1}{2} \times 6\frac{1}{2}$ ..	,,	10/4	
10 × 8 ..	,,	15/–	
12 × 10 ..	,,	22/6	

Postcards, Singles		100	3/–
,, Singles or Strips		500	13/–
,,	,, ,,	1000	21/6
,,	,, ,,	2500	20/6
,,	,, ,,	5000	19/6
,,	,, ,,	10000	18/6

Double Weight Bromide same price.
Double Weight Stenox 10% extra.

Special terms for quantities upon application.

Samples of Papers and Plates posted free on receipt of Trade Card. Write to

ACTINA LTD., 29 RED LION SQUARE, HIGH HOLBORN, W.C.1

BAUCHET PLATES

Clean, fast-working, giving brilliant negatives even in bad light, there is a Bauchet Plate to suit your needs, from the ultra-speed Hyperchrome to the contrasty Process.

BAUCHET CINE FILM

Reversible Orthochromatic Fine Grain 16 mm. & 9.5 mm. with ANTI-HALO SUB-COATING

gives better pictures all round, and it is a great help with difficult subjects. White objects come out sharp and clean, even under brilliant sunshine. It reduces the risk of fogging on spools as the light will not penetrate beyond the first turn of film.

RETAIL PRICES (Exclusive of Processing)

9.5 mm.	..	30 ft.	2/3
		50 ft.	4/–
16 „	..	50 ft.	6/6
		100 ft.	12/–

Trade Terms for Cine Films will be quoted on receipt of Trade Card.

A POSITIVE FILM IS ALSO AVAILABLE
Specially attractive Nett Prices quoted to Trade Printers upon application.

HYPERCHROME 1200 H & D
For high speed work or in bad light, brilliant, highly orthochromatic.

SUPER STUDIO 1200 H & D
Similar to Hyperchrome but with softer gradation, for portraiture.

HYPER 500 H & D ORTHO
Non-Screen, anti-halo, the ideal outdoor plate.

PROCESS 20 H & D
For copying, line work, etc.

Prices: $3\frac{1}{4}\times2\frac{1}{2}$ **1/1,** $\frac{1}{4}$-pl. **1/6,** $5\frac{1}{2}\times3\frac{1}{2}$ **2/6,** $6\frac{1}{2}\times4\frac{3}{4}$ **3/3,** 1/1-pl. **6/–.**
(Other sizes in proportion.)

DYNA 600 H & D
Suitable for both studio and outdoor work, brilliant, with full gradation and speed.

CELIA 300 H & D
For all-round work, particularly suited for outdoor work.

BLACK TONE and WARM TONE
Lantern plates, and for stereo positives.

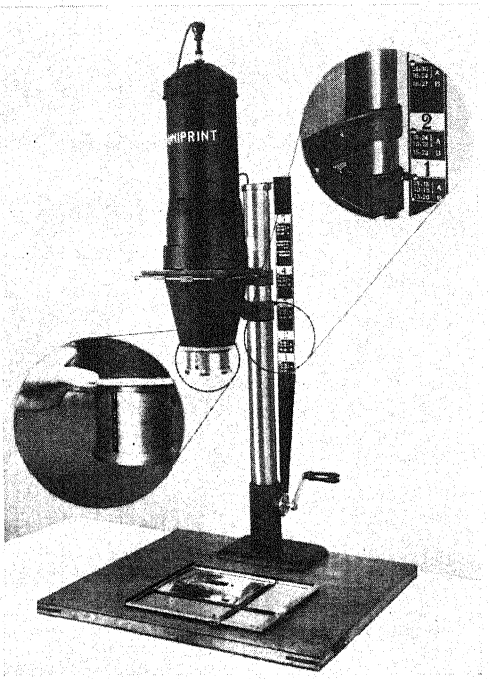
Prices: $3\frac{1}{4}\times2\frac{1}{2}$ **1/–,** $\frac{1}{4}$-pl. **1/5,** $5\frac{1}{2}\times3\frac{1}{2}$ **2/4,** $6\frac{1}{2}\times4\frac{3}{4}$ **3/1,** 1/1-pl. **5/10,** etc.

All Plate Prices are Net Professional. Special quotations for quantities.

Samples of Papers and Plates posted free on receipt of Trade Card.

SOLE CONCESSIONAIRES FOR BRITISH EMPIRE

UNIPRINT
ENLARGERS . . . .



Now fitted with a new 4-lens Meyer Helioplan Anastigmat specially constructed for Enlargers, absolutely free from light spots and colour defects, with exceptionally flat field and brilliancy. Through its special construction it throws an even light on the whole picture surface. The lenses are made of best Jena glass and absorb very little light.

UNIPRINT ENLARGER NO. 34

For negatives 9 × 12 cm. and smaller to Leica size. Specially designed for rapid production in modern D. & P. work. Works as fast as with contact printing. Solid and accurate construction that will stand daily use for many years. Smooth movement by handle, without shaking. Equipped with a scale for setting the apparatus in a few seconds only for a certain ratio of magnification. Lenses of 2 to 6 inches focus interchangeable, giving enlargements from 1 to 11 times.
Meyer Helioplan Anastigmat Lens of aperture F/4.5 and focus 135 mm. standard. Large condenser lenses of 160 mm./6¼ in. diameter, allowing part enlargements from half-plate negatives.

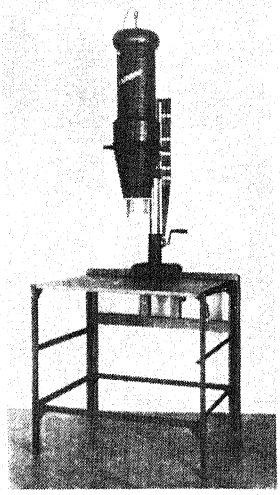
UNIPRINT 9 × 12 CM.

With Meyer Helioplan F/4.5, complete with Negative Carrier £19 19 0
Special Lens for Leica negatives, in interchangeable bayonet holder . . . . . Nett Professional Price £2 10 0

ACTINA LTD., 29 RED LION SQUARE, HIGH HOLBORN, W.C.1

For the Professional :

THE UNIPRINT NO. 35
13×18 CM.



Similar to Uniprint 9 × 12 cm. but supplied for negatives up to $5\frac{1}{4} \times 7\frac{1}{4}$ inches.

Fitted with Meyer Helioplan Anastigmat F/4.5 $8\frac{1}{4}$ inches and double condenser $8\frac{7}{8}$ inches.

Mounted on a steel table which provides two lower positions for the table top.

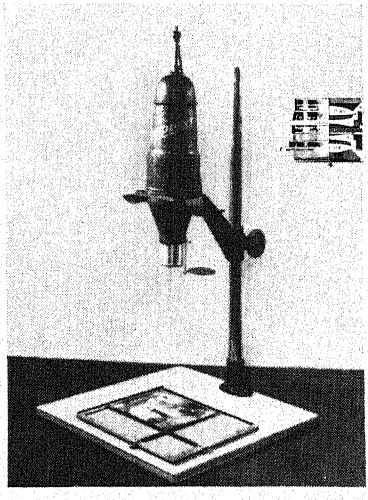
Supplied with 2 Negative Frames and 1 Masking Frame.

Nett Professional Price

£39 10 0

For the Amateur :

UNIPRINT JUNIOR
6×9 CM.



The Uniprint Junior is of a very good and solid construction with which $1\frac{1}{2}$ to 6 × linear enlargement of negatives up to 6 × 9 cm. can be made up to 40 × 50 cm. The Enlarger is mounted on a heavy column easy to raise or lower into approximate position. Focussing with the excellent Helioplan Double Anastigmat is done by screw adjustment. The lamp is a Nitra Opal Lamp 100 watts, in connection with a double condenser. Fitted with Meyer Helioplan Anastigmat F/4.5, 10.5 cm.

UNIPRINTJUNIOR 6 × 9 cm.
With Meyer Helioplan F/4.5, 10.5 cm. .. **£12 12 0**
7.5 cm. Lens for 6 × 6 cm. users supplied instead of 10.5 at no extra cost.

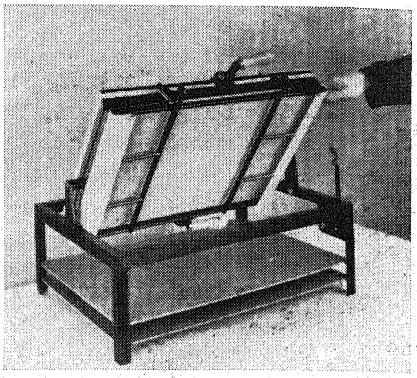
With Talbot f4.5 anastigmat **£10 10 0**

Usual terms to approved dealers

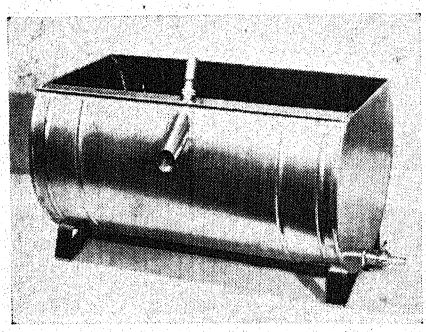
Sole Concessionaires for FRITZ WEIST, STOCKHOLM, SWEDEN

REVERSIBLE
HIGH GLOSS GLAZING PRESS

This press has more advantages than a usual glazing press and the capacity of a rotary cylinder dryer without any increase in the price.
The press has a built-in regulator which controls the heat and maintains a constant temperature. The time for drying is 5 minutes. In the chassis are 2 shelves for glazing plates.
Size 40 × 54 cm., it is made so that eight copies 18 × 24 cm., or 16 copies 13 × 18 cm. can be dried at the same time, when both sides are used.
The press is supplied with two glazing plates and connecting cable. Size of glazing plates, 39 × 53 cm. Energy consumption 600 watt, when using both sides; 350 watt, if using only one side.



Weight Kg. 18 net	Length 65 cm.
Width 53 cm.	Height 35 cm.
Without glazing plates	**£10 15 0**
Glazing plates 39 × 53 cm. (15½" × 21")	**18/- each**



"NEPTUN"
PRINT WASHER
IN STAINLESS STEEL

After many years of experience, we have succeeded in constructing a washer which has the following advantages:
1. The washer is made of stainless steel and of higher durability than others on the market.
2. It is easy to keep clean.
3. No motor or cylinder is used, the water is held in rotary movement by its own pressure, without any risk of the prints sticking to the sides of the washer, and the prints are thoroughly washed.

Weight 3.2 kg.	Length 46 cm.
Width 30 cm.	Height 28 cm.

PRICE £6 15 0

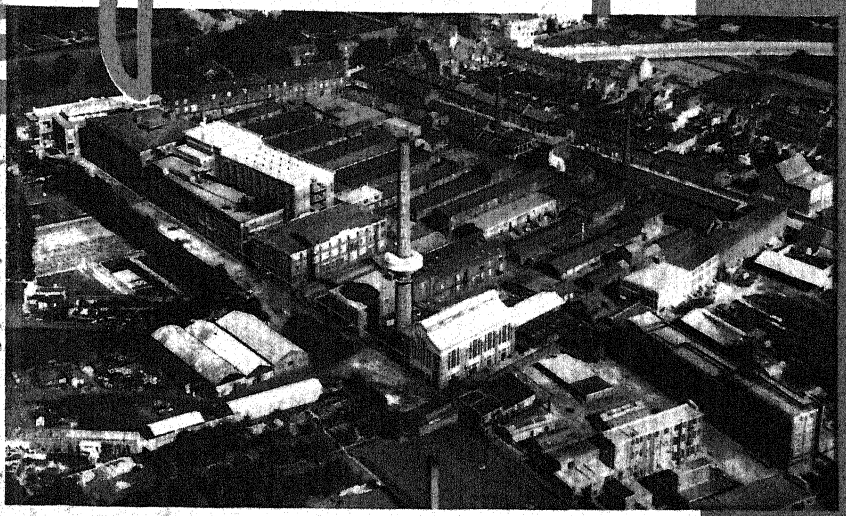
Prices apply in Great Britain and Northern Ireland only.

ACTINA LTD., ***Sole Concessionaires for Great Britain & Ireland***
29 RED LION SQUARE, HIGH HOLBORN, LONDON, W.C.1.
Telephone and Telegrams: Chancery 8541

FOR ALL **UNIPRINT** ENLARGERS AND D. & P. APPARATUS MADE BY
FRITZ WEIST—STOCKHOLM—SWEDEN
SPECIALISTS IN D. & P. APPARATUS *Cables: Weist, Stockholm*
Sole Distributor in the United States: Mr. ROBERT M. LYNN, LOS ANGELES

Gevaert

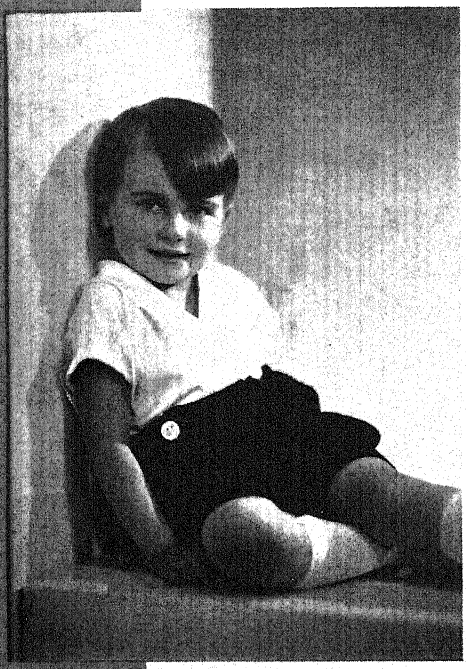
THE QUALITY BRAND



Apart from their well known reliability and uniformity, the Gevaert products are highly appreciated all over the world for their rich variety and the accurate adaptation of each product to the purpose for which it is intended.

There is a perfect Gevaert product for each photographic and cinematographic purpose.

- PLATES and FILMS—Orthochromatic and panchromatic, from 500 H. & D. up to 8000 H. & D., for studio and commercial photography, for graphic work, for amateur photography.
- CINE FILMS—For professionals and amateurs; Sound Films for all systems.
- X-RAY FILMS—For medical and technical purposes.
- PAPERS—Bromide and chlorobromide for blue-black and warm tones, in an unequalled range of surfaces and contrasts :
  - for professional photography.
  - for photo-finishing.
  - for commercial, industrial and scientific work.
- DOCUMENT PAPER—For every type of apparatus.



FOR
STUDIO
AND
COMMERCIAL
PHOTOGRAPHY

Gevaert

ULTRA PANCHRO
8000
PLATES
FILMS

Combining true panchromatic quality without over-correction or infra-red effect, with extremely high speed and a delicate scale of gradation.



FOR PRESS WORK

Gevaert

SUPERCHROM R
ULTRA PRESS ORTHO

SUPERCHROM R

An orthochromatic plate of amazingly high speed, vigorous gradation, fine grain and quick developing, fixing and drying qualities.

ULTRA PRESS ORTHO

The all-round Press Plate, somewhat less sensitive than Superchrom R, but still quicker in developing, fixing and drying.

NOW SHARP PICTURES AGAINST THE LIGHT !



GEVAERT AMATEUR CINE FILMS

The new Gevaert Reversal Films with a black non-halation layer between the film and the support. Absolutely clear-cut and fully detached pictures in most difficult lighting conditions.

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GEVAERT PANCHRO REVERSAL SUPER.—24-25° Sch., with brilliant gradation, high panchromatic quality, fine grain and great latitude in exposure.

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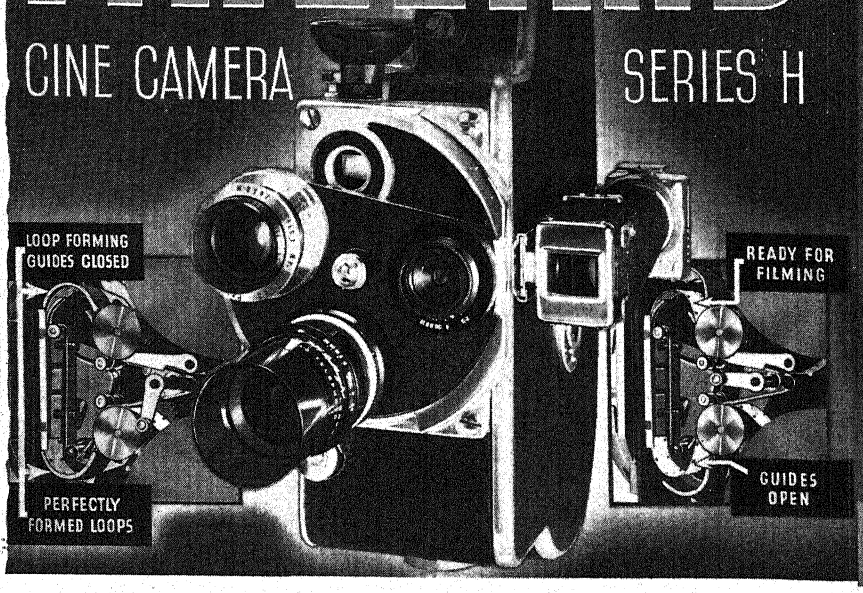
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Gevaert

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THE CINE CAMERA THAT LOADS ITSELF

Handy to use, with all controls conveniently placed this camera gives the scope of a professional camera, at a price that is a remarkable achievement for an instrument giving such a high standard or performance. It has three important exclusive features :—

1. Semi-automatic daylight loading, certain and instantaneous. This new principle gives rapid loading, yet retains all the advantages of sprocket feed, essential to absolute steadiness (Paillard patent). The film threads itself automatically through the sprockets and gate, making its own loops.
2. Semi-circular turret head for three interchangeable lenses, avoiding bulk yet giving large distance between lenses, which safeguards the field of short focal length lenses.
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Model H.16 for 16 mm. films fitted with Dallmeyer *f*/1.5 Speed Anastigmat .. **£55**

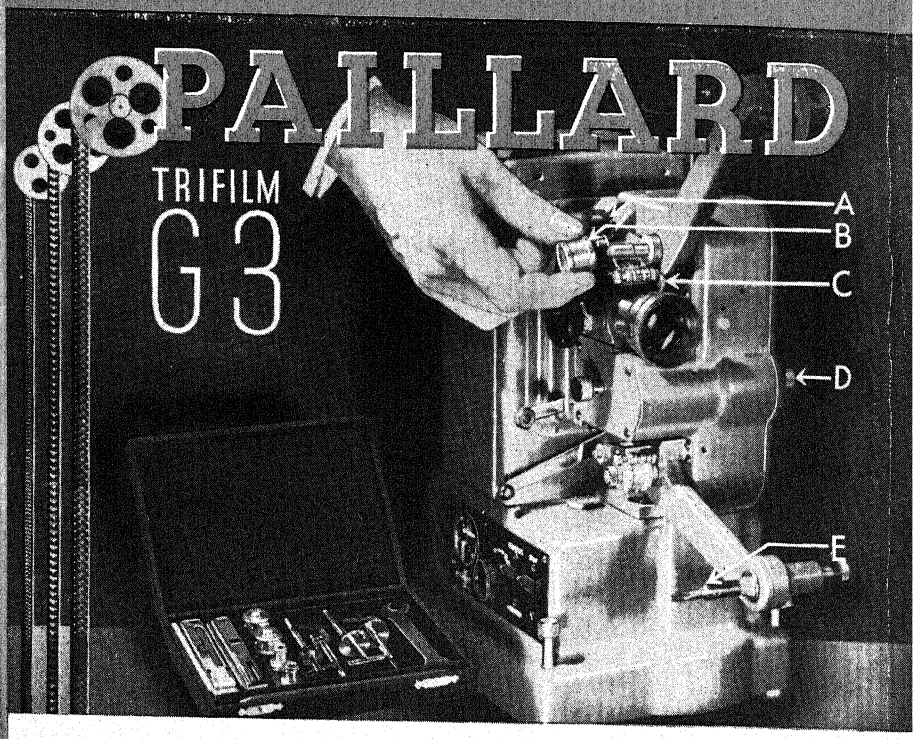
Model H.9 for 9.5 mm. films fitted with Dallmeyer *f*/1.5 Speed Anastigmat .. **£55**

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CINEX LIMITED

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E. PAILLARD & CO



One Projector showing 8, 9.5 and 16mm. films

This machine has all the well known characteristics for which Paillard-Bolex projectors are famous (tremendous screen illumination without sacrificing definition and mechanism made with watch-like precision, ensuring minimum film wear and very silent running) as well as the important advantage of showing any of the three sub-standard film sizes.

The change from one film size to another only takes a few seconds and the illustration above shows how this is carried out by altering sprockets B, film guides C, pressure pad A, spools spindles E, and throwing-in knob D, which alters the course of the claws.

Brief specification: *One hundred per cent. enclosed gear drive. Extremely powerful illumination showing 8 mm. films at their best, with possibility of using special short focal length lens giving quite big pictures from 8 mm. with only a short throw. Still pictures, reverse projection, absolute security of film transport avoiding all possibility of damaging films, interchangeable lamps 500 watt and 250 watt (the latter costing only 21/-). Interchangeability of lenses from f/20 mm. up to* 4-in.

G.3 Projector, with accessories, fitted Dallmeyer 2-in. lens and 500 watt lamp **£60**

Hugo-Meyer special eccentric *f*/20 mm. lens for projection of 8 mm. film **£4**

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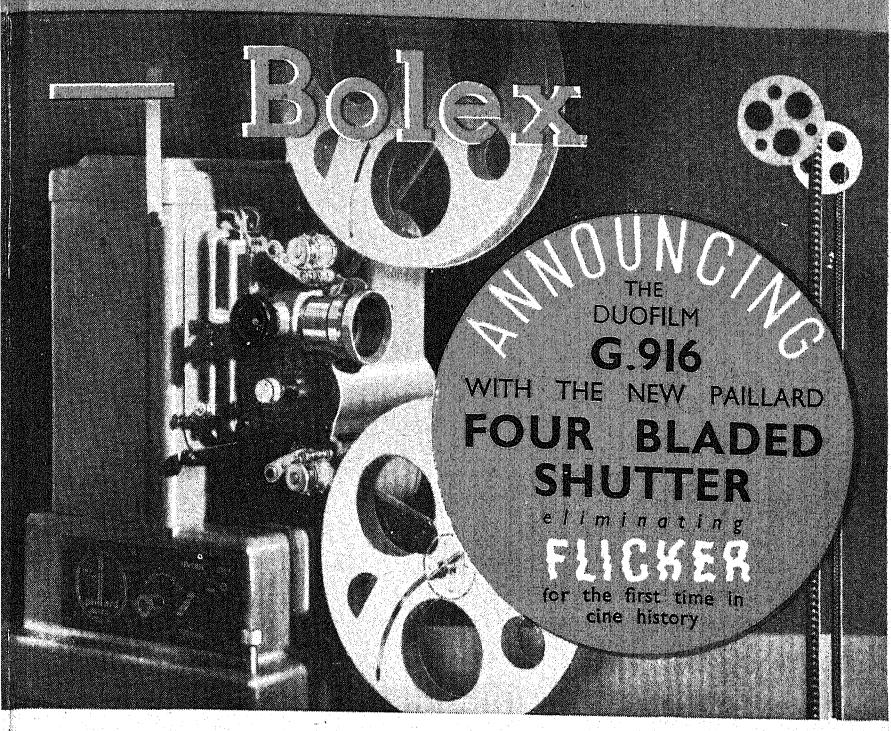
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Sole Australian Distributors : KINELAB FILM SERVICE

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Dept. Cinemas - Ste. Croix - SWITZERLAND



AT LAST—FLICKERLESS HOME MOVIES!

Paillards again lead the way with a remarkable cine improvement giving a standard of flickerless projection incomparably better than anything that has ever been achieved before. Fitted with a mechanism equivalent to a four-bladed shutter this machine projects at 12 **pictures per second,** yet flicker is reduced to the **point where it becomes negligible.** Action is not appreciably slowed up, yet there is time to see every detail of every movement—you will be amazed at the added quality given to your films. The fact that the film is projected slower means that you get 25% longer programmes from your films, very silent running (no need to race machine in an effort to cut down flicker) and minimum film wear. Another important advantage is that if your camera will film at 12 pictures per second you can take certain subjects at this speed with a very marked saving in film, besides being able to film in lighting conditions that would be out of the question at higher speeds. This projector shows 9.5 mm. and 16 mm. films and the specification is similar to the G.3 on the page opposite.

Model G.916, for projecting 9.5 and 16 mm. films, price with Dallmeyer 2-in. lens and 500 watt lamp .. **£47**

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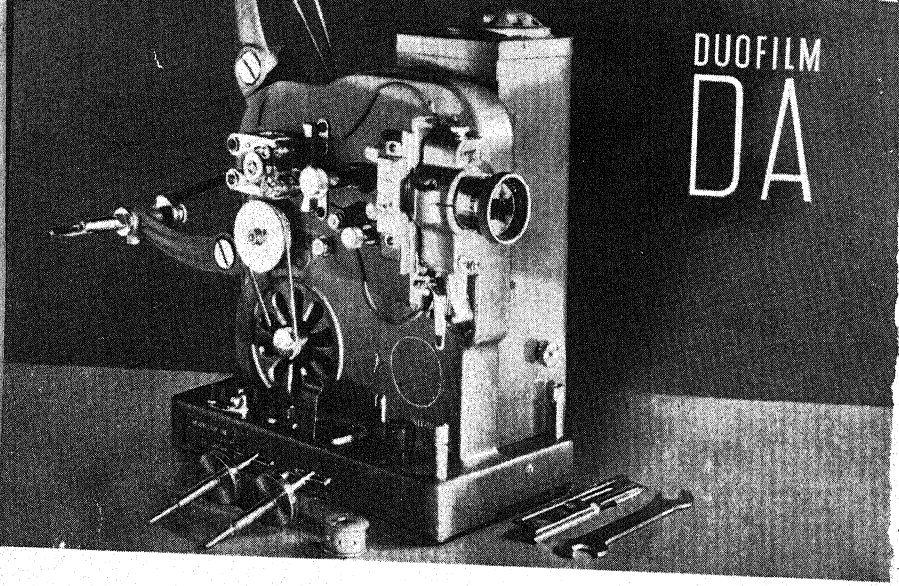
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PAILLARD-Bolex



The projectors listed below have all the characteristics for which Paillard apparatus is famous—sound design, precision construction and a high standard of flickerless performance.

The illustration shows the model D.A. for both 9.5 mm. and 16 mm. films. The same machine is available in mono film models, the K8 for 8 mm. films, the PA for 9.5 mm. films, the C for 16 mm. films. All fitted with 400 watt lamp giving ample illumination for "Home" use on screens up to 8-ft. wide if required. **A three-bladed** shutter mechanism ensures flickerless projections at normal speeds.

Model D.A. for both 9.5mm. and 16mm. films	**£37 10 0**
Models K8, PA and C	**£25 10 0**
Resistance for voltages 200 to 250 for any of the above models	**£1 17 6**

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A Complete System of Colour Photography.

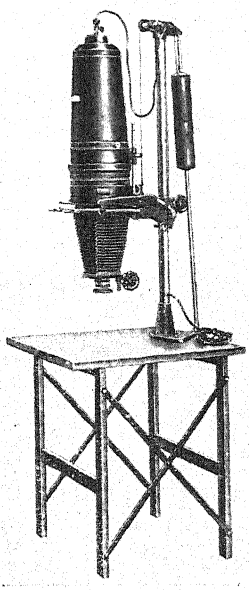


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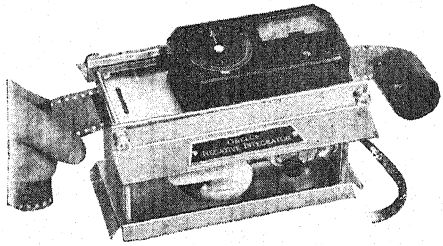
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A new instrument makes it possible for you to determine the correct printing time, grade of paper, amount of fog, and other useful information about your miniature film.



Price (without exposure meter) £3 . 0 . 0.

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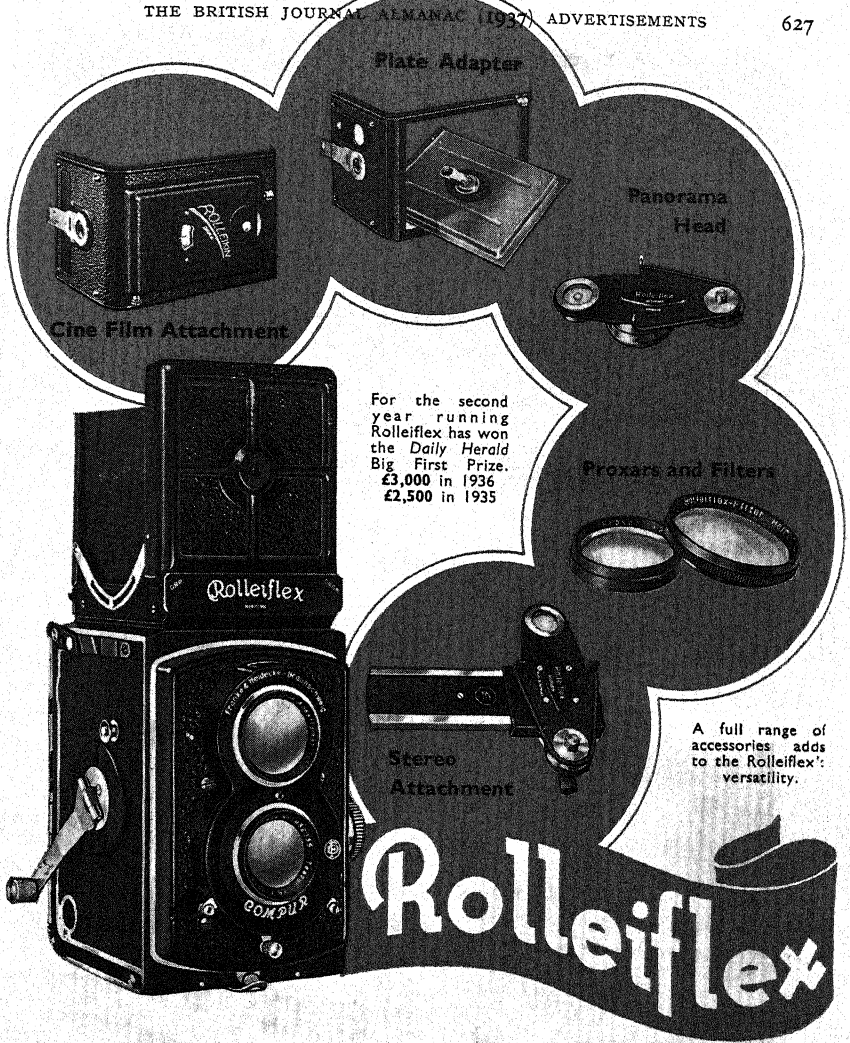
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£3,000 in 1936
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A full range of accessories adds to the Rolleiflex's versatility.

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Why does Rolleiflex win the big prizes. Because it is a camera of unusual merits and can be used with instant success by inexperienced and expert photographers alike. You look into the hood and see your subject crystal clear, right way up, full picture size. Full parallax compensation is provided for. Lens stop and shutter speeds can be adjusted with the camera in the taking position. 12 pictures on 3¼ × 2¼ 1/- roll film. Compur shutter, 1 sec. to 1/500th, T. & B. Zeiss Tessar F/3.5 lens, **£25**. The 4×4 cmm. Rolleiflex takes 12 pictures on V.P. roll-film. With Zeiss Tessar F/2.8 lens, **£26**.

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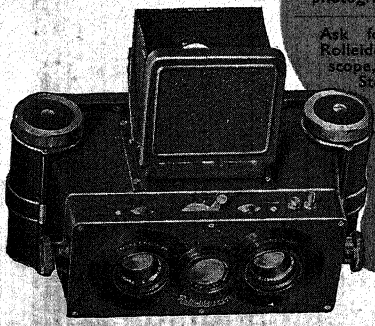
Rolleicord is a "near relative" of the famous Rolleiflex. It offers facilities which you don't get with ordinary cameras, and when you study the points incorporated in its design, you will readily admit that it is amazing value. It has Automatic Film Wind, making overlapping of exposures impossible; New Type Reflex Hood, and large Magnifier. For taking pictures at eye-level the object is viewed through a mirror and double magnifier combined; Depth of Focus and Focussing Knob combined; Engraved Exposure Plate at back of Camera. It takes 12 pictures on 3¼ × 2¼ 1/- roll film, and shows the picture full size and right way up. It can be adapted for plates or 35 mm. cine film, and takes all Rolleiflex accessories except only the angle mirror. Has Compur shutter speeded to 1/300th sec. T. & B. and Zeiss Triotar F/3.5 lens, **£16 . 10 . 0.** Zeiss Triotar F/4.5 lens, **£14 . 10 . 0.**



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Ask for particulars of Rolleidoscope and Heidoscope, the world's best stereo Cameras.



Rolleidoscope Heidoscope

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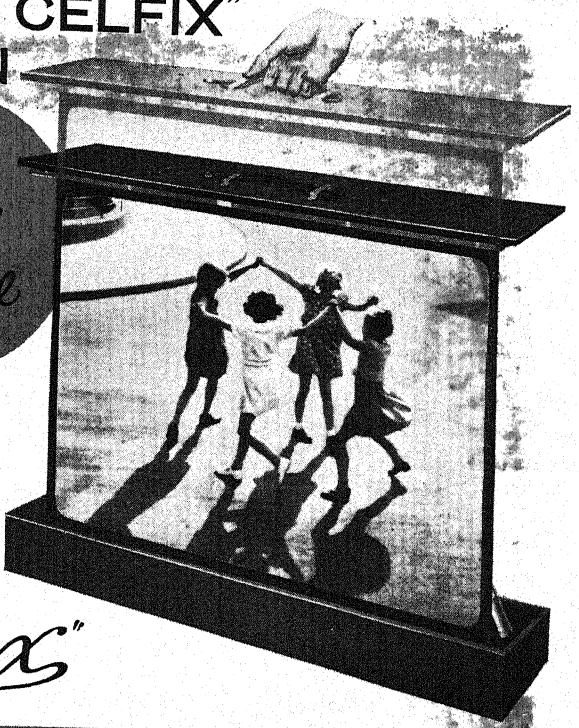
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Two Screens in one



The **DUO-** *"Celfix"*

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The new screen which gives an extension so that square as well as oblong pictures can be projected. At the release of a button and a gentle pull it automatically opens to oblong shape — an extra pull, and it extends for a square picture. It has the famous "Celfix" crystal-glass beaded surface.

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THE "CELFIX" CINE SCREEN

Patented throughout the world.

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There is nothing to equal it for super brilliance and long wearing qualities — exhaustive tests have proved this! The "Celfix" Crystal-Glass Beaded surface is made under a secret formula, this and its protective construction ensures its first brilliance lasting over a number of years. The "Celfix" Silver surface is also the best of its kind—the little extra you pay for "Celfix" is economy in the end. Portable, self-erecting, rigid and taut.

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Cat. No. 3.—	„ 63 × 47 in.,	„	£10	0	0	„ „	...	£12	15	0
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Manufacturers:

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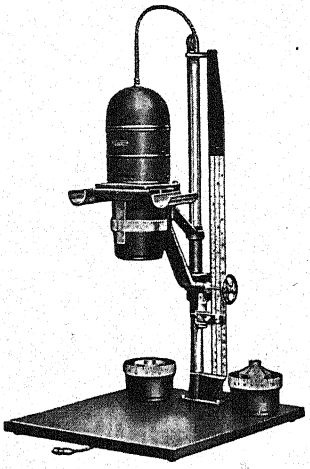
WITH STRENGTHENING AMPLIFIER FOR ACCURATE ARTIFICIAL LIGHT READINGS

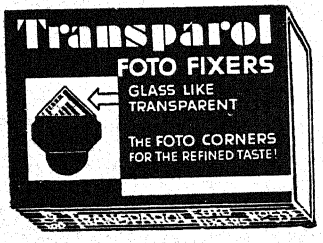
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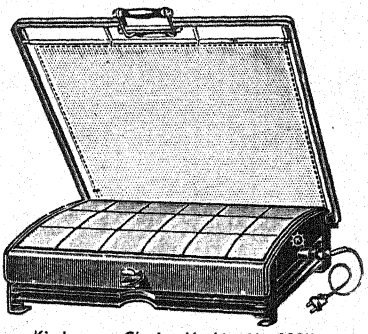
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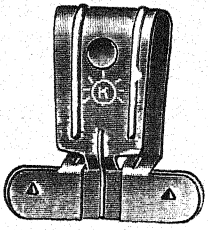
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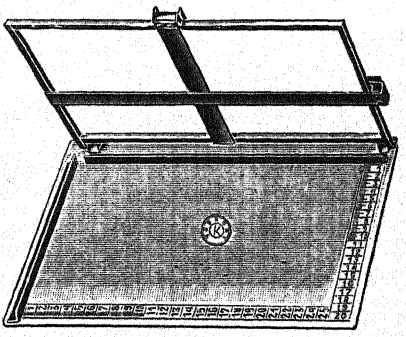


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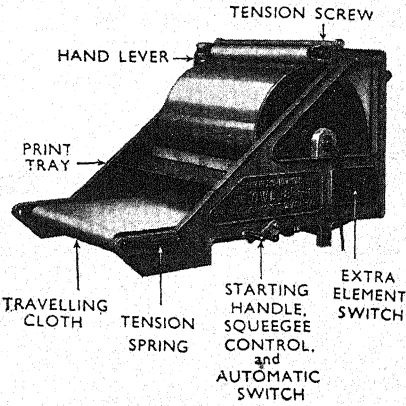
Designed by a practical finisher who knows what is needed in workrooms.

On price alone this machine is the most economical. On output, it compares with the rest. It is made for really hard service, to stand up to continuous use during a busy season.

Ball-bearings make the running easy (it will run for 16 hours on one unit of electricity).

Heating elements are specially chosen to give long-life; the fabric drying bands are specially manufactured; and the stainless steel drum will give unlimited service and a perfect, flawless glaze.

This machine embodies the most modern ideas in design, construction and equipment. It is a Finisher's machine for finishers. Send for full particulars to-day.



1937 Model much improved

Price £33 : 10 : 0 net

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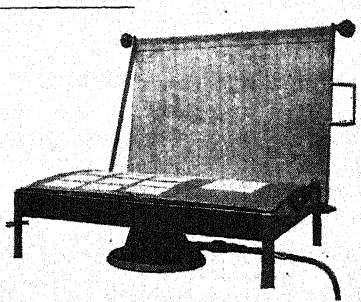
Dries and glazes in five minutes.

Will take any kind of glazing plate up to 24" × 18".

Very substantially made of strong copper.

Water Jacket prevents prints from burning.

A child can use it.



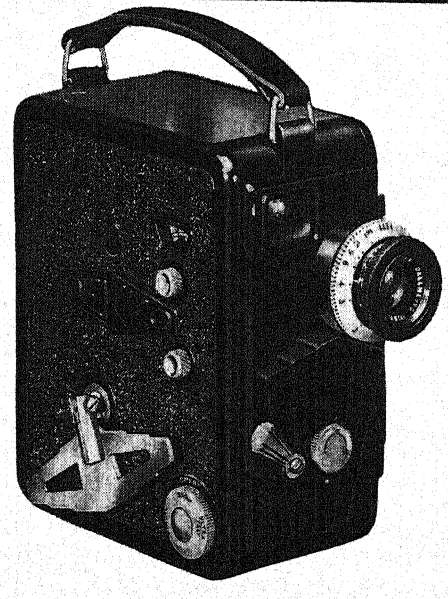
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Complete with one only super polished stainless steel glazing plate size 24" × 18". Much improved and fitted with two cloths. May be used for glazing prints or drying matt or any other surface.

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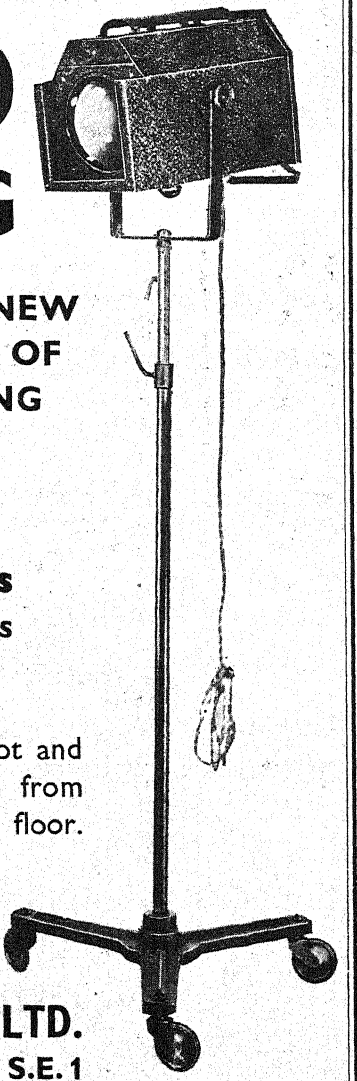
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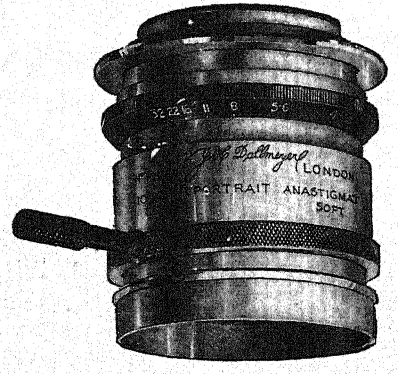
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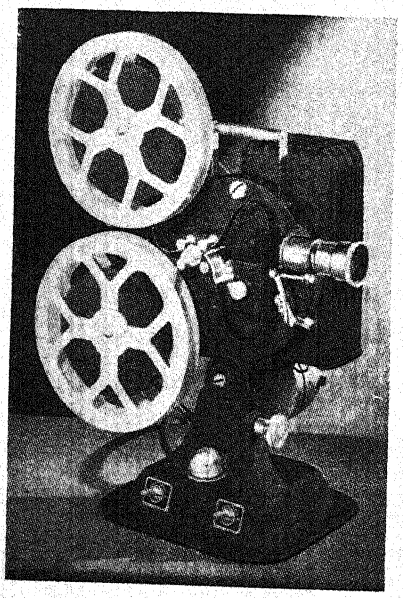
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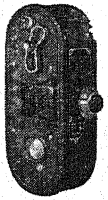
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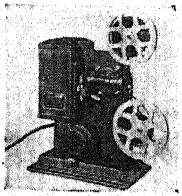
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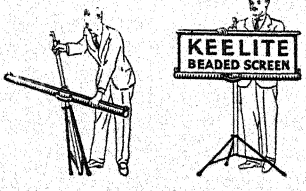
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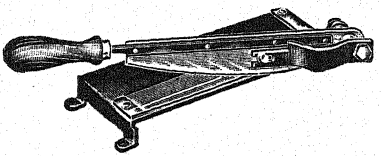
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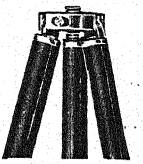
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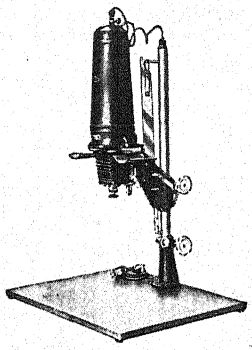


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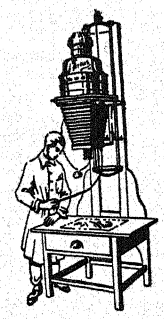
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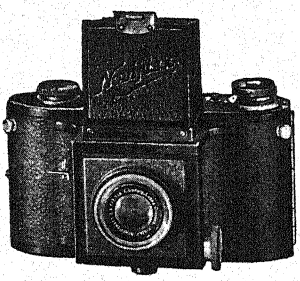
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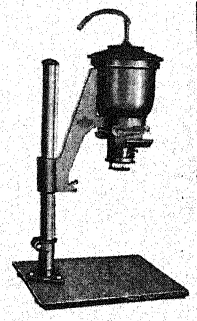
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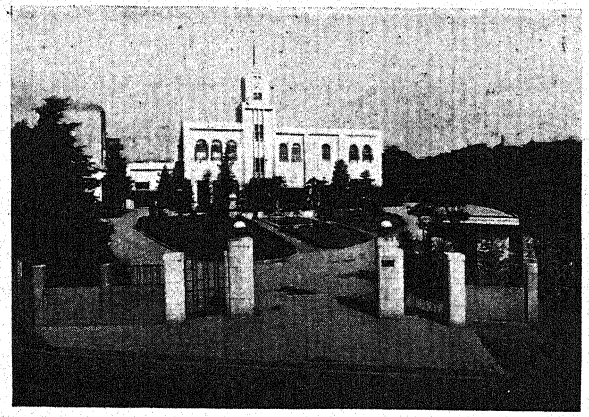
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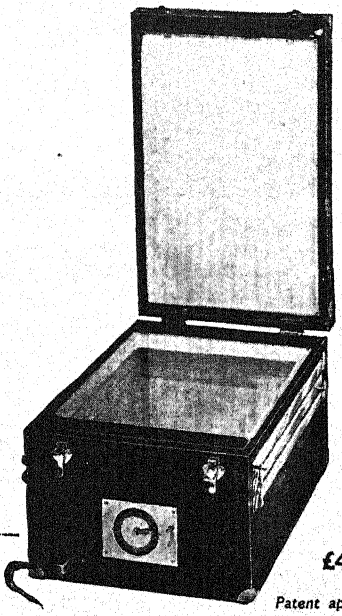
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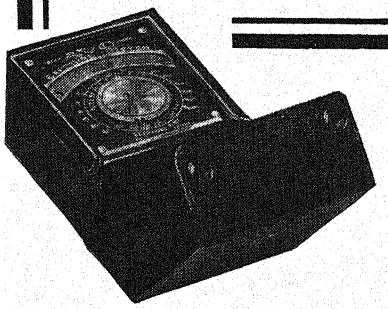
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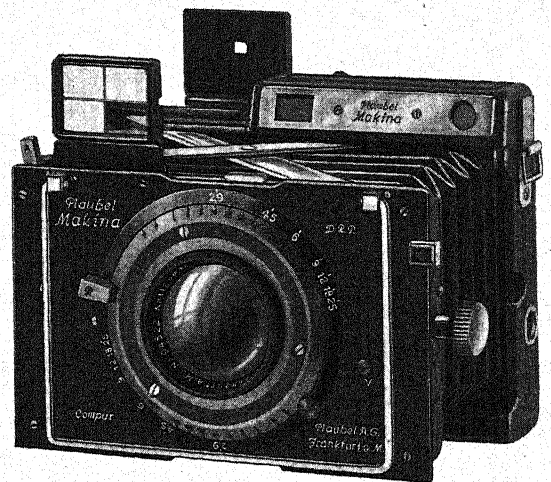
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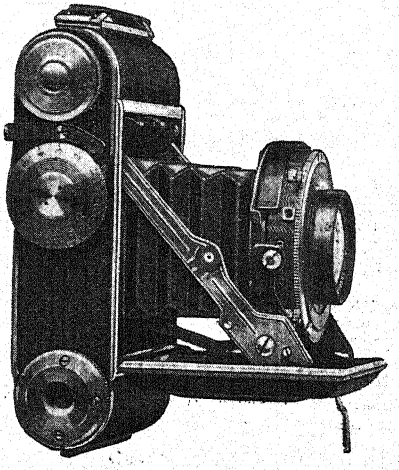
Price £39 10 0

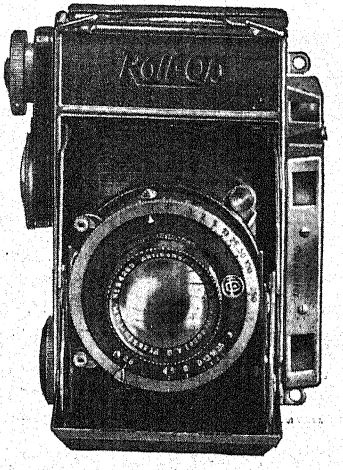
	£	s.	d.
Tele-Makinar, *f*/6.3, 21 cm., in leather case	12	12	0
„ „ *f*/5.4, 21 cm., „ „	16	16	0
Rapid Wide-Angle Orthar, *f*/6.8, 7.3 cm., in leather case	7	5	0
T 1.5, for photographs at a distance of about 60 cm.	1	1	0
R 0.1, for small objects (stamps, etc.) in natural size	1	5	0
Yellow Filter, Light, Medium or Dark ... ... each	1	10	0
Solid Leather Case, with Lock and Key	1	10	0
Film Pack Adapter	0	17	6
Makina Roll Holder, for 8 standard $3\frac{1}{4}\times2\frac{1}{4}$ in. or 16 $4\frac{1}{2}\times6$ cm. pictures	2	10	0
Dark Slides	0	5	0
Panoram Head	1	15	0
Makigraph for Reproduction and Enlarging	20	0	0

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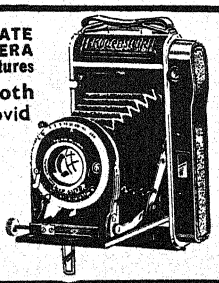
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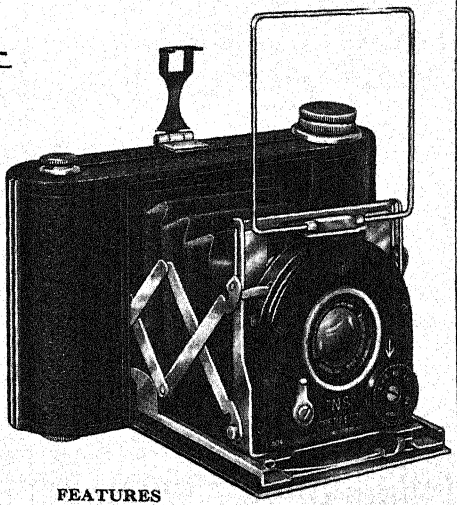
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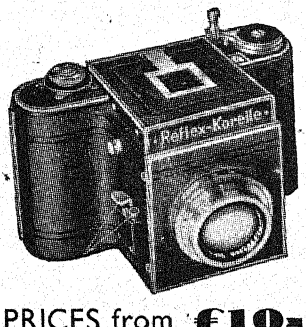
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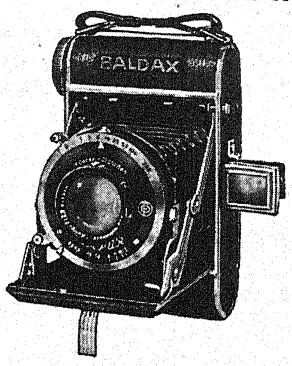
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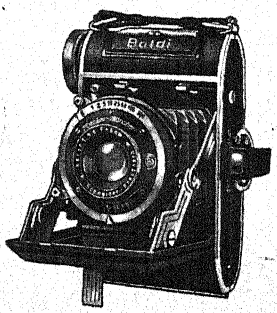
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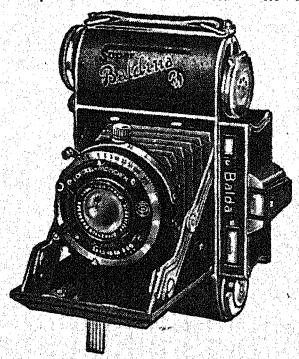
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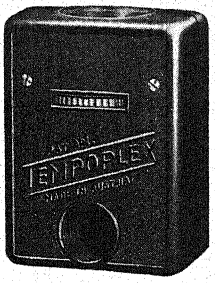
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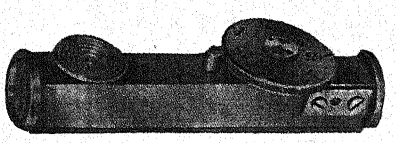
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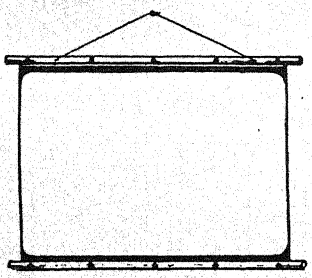
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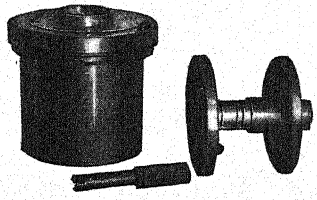
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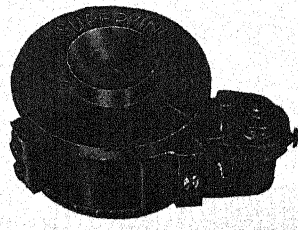
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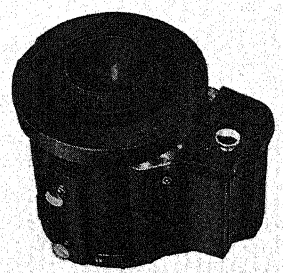
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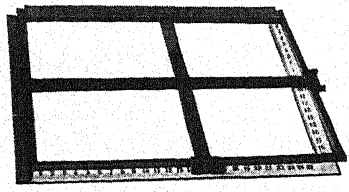
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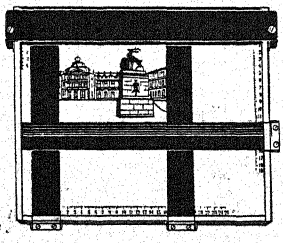
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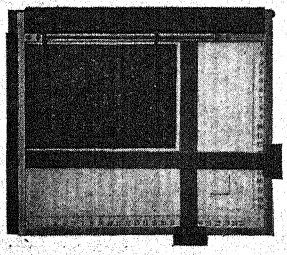
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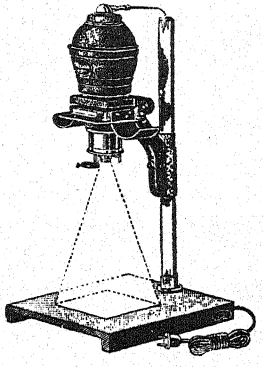
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Every miniature camera of distinction is on demonstration at our showroom. Besides actual cameras we have every accessory for the Leica, the Contax, The Exakta, the Rolleiflex and the Super Ikonta. All miniature enlargers are kept in stock. In addition to apparatus, we have all types of special negative material and fine grain developers. These developers include THREE DIFFERENT PARAPHENYLENE-DIAMINE FORMULÆ especially made up by us for use with different types of negative emulsions as well as such proprietary developers as ULTRAFIN, MERITOL, SUPRAMIN, LEICANOL, ETC.

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issue with every camera a guarantee of mechanical and optical perfection. Used miniature cameras may in fact be purchased from us with precisely the same degree of confidence as new goods.

MINIATURE FILM PROCESSING.

We were the first firm in Great Britain to undertake the fine-grain development of miniature films by individual methods. We still remain the only firm exclusively undertaking the processing of miniature films. Our superior experience gained in this way is at the disposal of serious amateur photographers, who, lacking the time or facility to do their own processing, require a better type of service than that customarily afforded by large, standardized organizations working on mass production principles. We now receive miniature films for special fine-grain development from all parts of the world. Keen miniature photographers realise that only a genuine specialist service will give them satisfactory negatives capable of producing grain-free and flawless enlargements.

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We are able to place at the disposal of miniature camera users a rapid and efficient repair service. Repairs to miniature apparatus call for a high degree of technical skill, long experience and many special tools. We are fully equipped in this way and employ a highly-trained technical staff. Previously the repair of expensive miniature cameras meant waiting weeks—often months—while they were returned to Germany. We can now undertake practically any repair and return the apparatus within a few days. Repairs to miniature cameras only can be undertaken.

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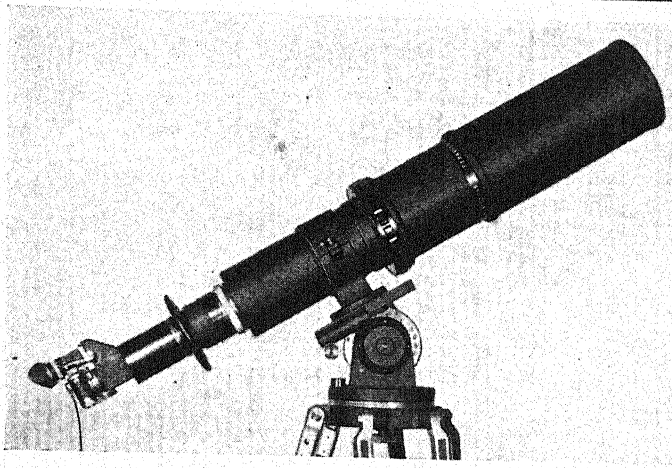
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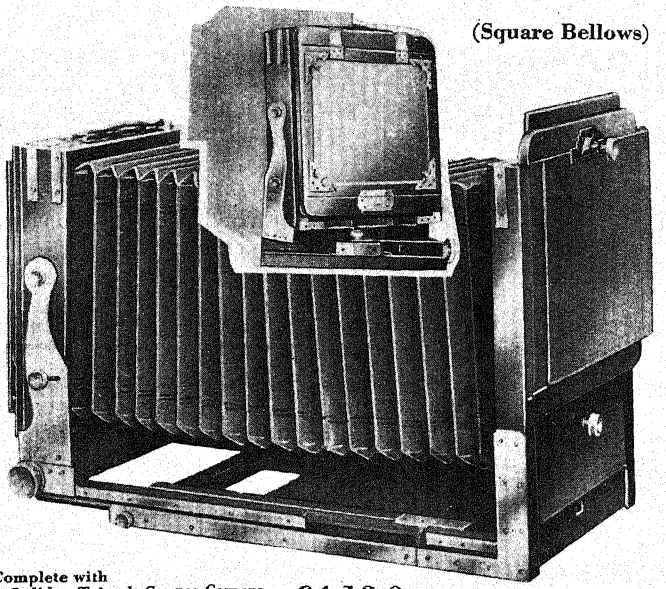
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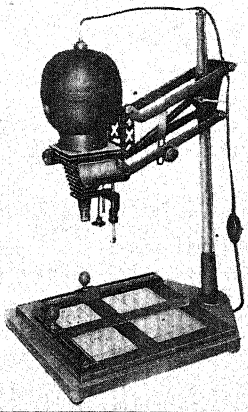
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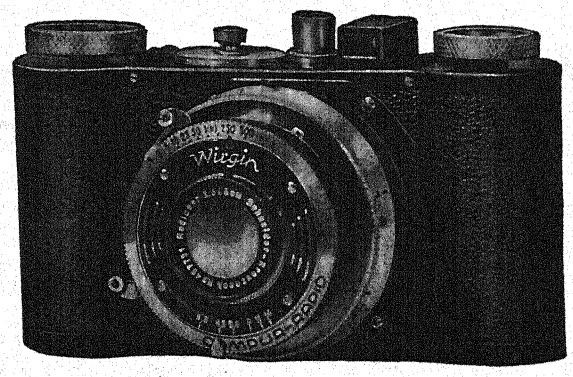
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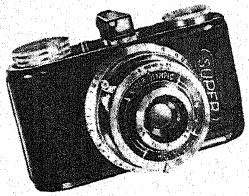
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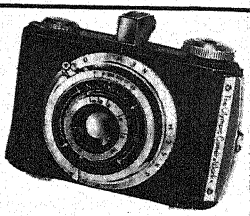
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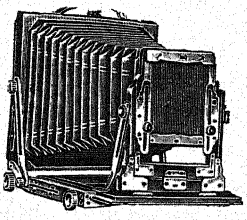
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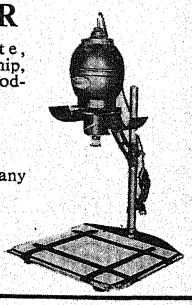
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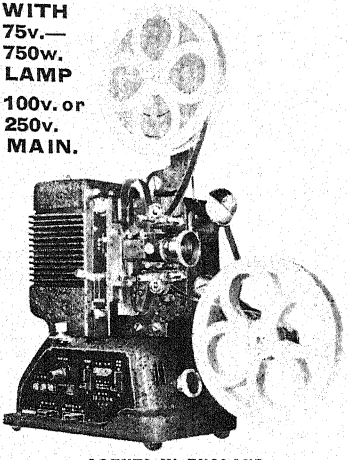
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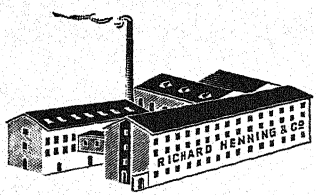
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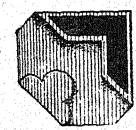
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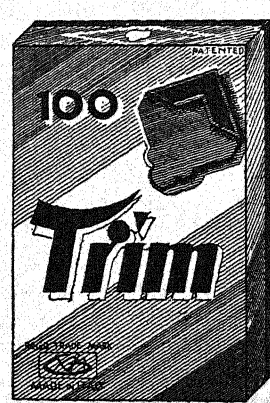
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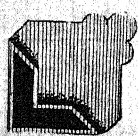


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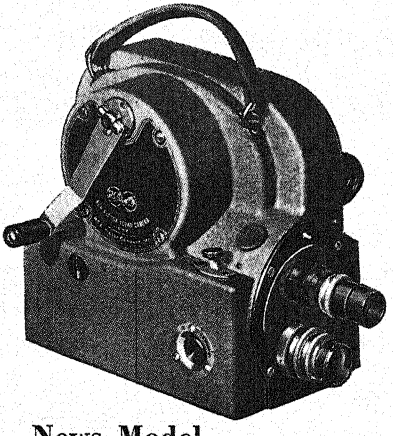
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The following descriptive list of the articles selected for the 1937 American Annual of Photography gives an approximate idea of the contents of this book. These articles cover most of the fields interesting to the modern amateur and professional worker and form an excellent introduction to advanced modern methods in many branches of photography. In addition to these articles the usual departments will appear, including Who's Who in Pictorial Photography, with its record of the addresses and pictorial standing of thousands of pictorial workers, a list of the American camera clubs, and a practical and concise Formulary.

SO YOU WANT TO BE AN ARTIST, by Nicholas Haz.
PHOTOGRAPHY OF THE INFRA-RED, by Dr. Walter Clark.
THE CONTROL OF NEGATIVE CONTRAST BY DILUTION OF THE DEVELOPER, by Paul E. Boucher.
COMPOSITION BY COMBINATION, by G. L. Hawkins.
MODERN AMATEUR PHOTOGRAVURE, by Laurence Dutton.
MOVIES IN COLOR, R. Fawn Mitchell.
PHOTOGRAPHY BY POLARIZED LIGHT, by J. W. McFarlane.
LENSES AND CAMERAS FOR BIRD AND NATURE PHOTOGRAPHY, by A. Dawes DuBois.
PICTORIAL SECTION, 96 FULL PAGE PLATES.
HOW I MAKE MY OIL PRINTS, by Leonard Misonne.
CIVIL WAR PHOTOGRAPHERS, by Robert Taft.
THE DETERMINATION OF SENSITIVITY BY DIN METHODS, by Dr. Kurt Jacobsohn.
THE DIN SYSTEM OF SPEED DETERMINATION, by Dr. Walter Clark.
PHOTOFLOOD AND PHOTOFLASH PHOTOGRAPHY, by Neil Wayne Northey.
THE QUALITY OF THE NEGATIVE, by Charles W. Seager.
AMATEUR SENSITOMETRY, by F. L. English.
RECTIFYING CONVERGING PERPENDICULARS, by Harold G. Grainger.
MASTERING THE MINIATURE CAMERA, by E. E. Bucher.
FACIAL ANALYSIS AND FACIAL EXPRESSION IN PORTRAITURE, by J. Vincent Lewis.
CONTROL OF CONTRAST IN COPYING, by Edward A. Grone.
THE PHOTOGRAPHY OF ELECTRIC ARCS, by Arthur Palme.
PINHOLE PHOTOGRAPHY, by Charles A. Heyser.
HOW TO ORGANIZE A SALON, by Frank R. Fraprie.
CRITICAL FACTORS IN THE PAPER NEGATIVE PROCESS, by Charles W. Seager.
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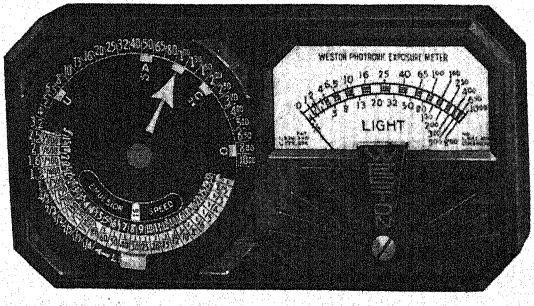
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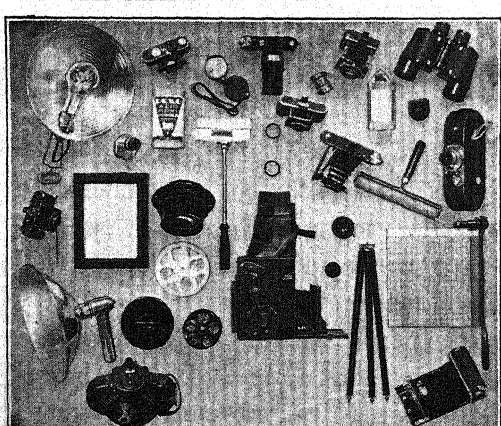


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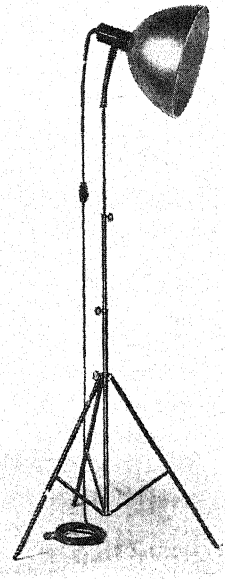
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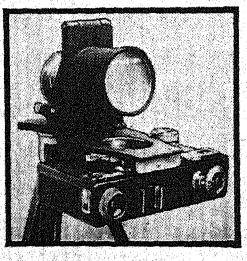
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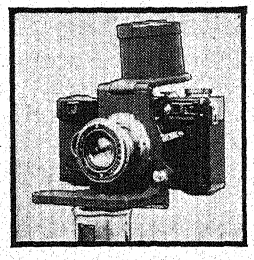
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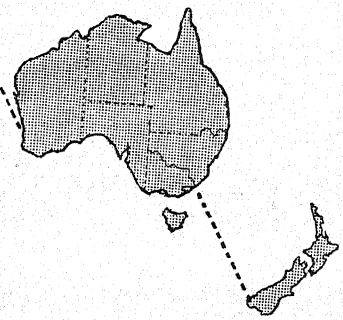
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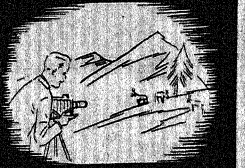
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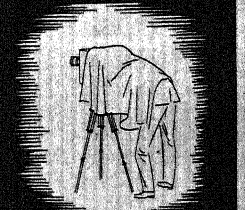
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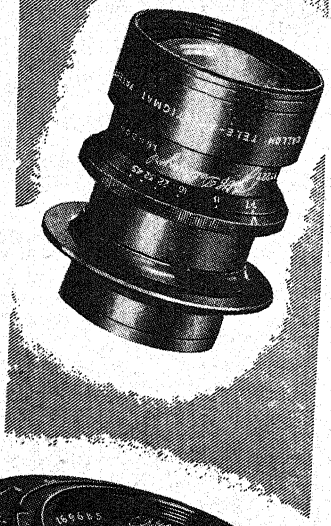


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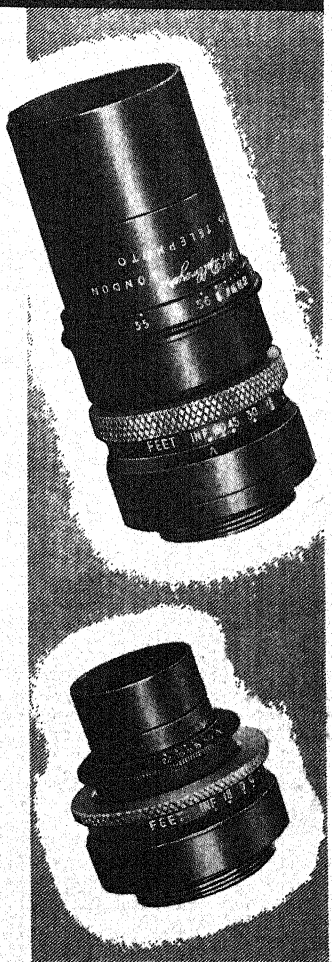
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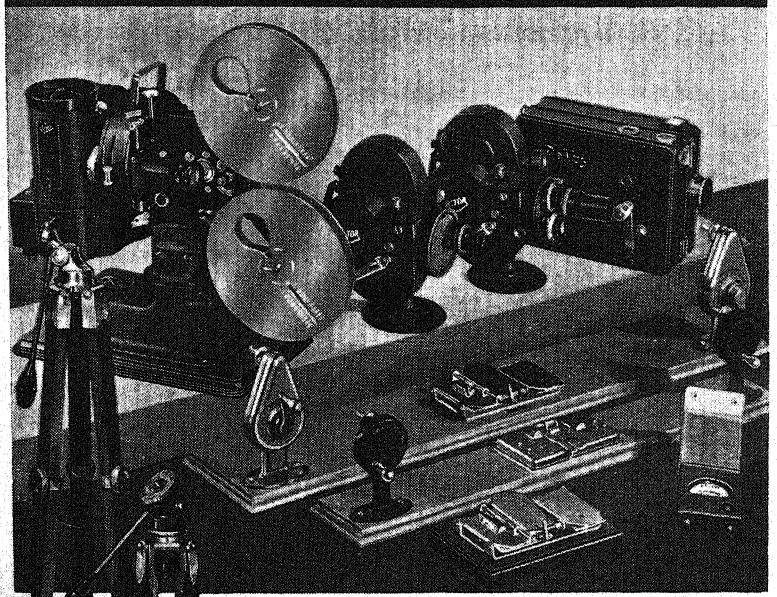
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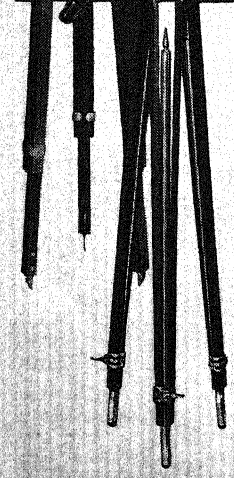


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Austin Edwards, Ltd., Coventry Road, Warwick. 'Phone, Warwick 108 Telegrams—Films, Warwick.

Automatic Coil Winder and Electrical Equipment Co., Ltd., Winder House, Douglas Street, London, S.W. 1. 'Phone, Victoria 3404-7. Telegrams—Autowinda, Churton, London.

Autotype Co., Ltd., 59, New Oxford Street, London, W.C. 1. 'Phone, Temple Bar 9331-2-3. Telegrams—Autotype, London; Autotype Works, Brownlow Road, West Ealing, W. 13. 'Phones, Ealing 2691-2-3. Telegrams—Autotype, West Ealing.

Baird, Andrew H., 33-39, Lothian Street. Edinburgh. 'Phone, Edinburgh 20916. Telegrams—Radium, Edinburgh.

Baker, Charles, 244, High Holborn, London, W.C. 1. 'Phone, Holborn 1427. Telegrams—Optivorum, Holb., London.

Ballantine, Robert, 103½, St. Vincent Street, Glasgow, C.2. 'Phone, Central 5619.

Bamforth & Co., Ltd., Station Road, Holmfirth, Yorks. 'Phone 107. Telegrams—Bamforth, Holmfirth.

Barlow, J., & Co., 8-12, Lambeth Palace Road, London, S.E. 1. 'Phone, Waterloo 5312. Telegrams—Barlassoff, Lamb, London.

Barratt's Photo Press, Ltd., 89, Fleet Street, London, E.C. 4. 'Phone, Central 7734. Telegrams—Central 7735 London.

Barton, Harvey & Son, Ltd., St. Michael's, Bristol. 'Phone, 21723. Telegrams—Harvey Barton, Bristol.

Bartons' (B'ham), Ltd., Roland Road, Handsworth, Birmingham. 'Phone, Northern 3391. Telegrams—Mountable, Birmingham. Also 14, Upper Thames Street, London, E.C. 4. 'Phone, Central 4191.

Bauchet, M., & Cie., 29, Red Lion Square, London, W.C. 1. 'Phone, Chancery 8541. Telegrams—Zedabepeay, Holb., London.

Bausch and Lomb Optical Co., Ltd., Africa House, Kingsway, London, W.C. 2. 'Phone, Holborn 6604.

Bayer Products, Ltd., Africa House, Kingsway, London, W.C. 2. 'Phone, Holborn 8730.

Beard, R. R., Ltd., 10, Trafalgar Road, Old Kent Road, London, S.E. 15. 'Phone, Rodney 3136.

Bell & Howell Co., Ltd., 13-14, Great Castle Street, Oxford Circus, London, W. 1. 'Phone, Langham 3988-9. Telegrams—Belanhowe, Wesdo, London.

Bellingham & Stanley, Ltd., 71, Hornsey Rise, London, N. 19. 'Phone, Archway 2270. Telegrams—Polyfract, Phone London.

Bennett & Jennison, Ltd., Ladysmith Road, Grimsby. 'Phone 2255. Telegrams—Novelties, Grimsby. London showrooms, 67, Aldersgate Street, E.C.3. 'Phone, National 9489.

Beresford, F., 20, Melody Road, Wandsworth Common, London, S.W. 18.

Beta Ltd., Ashfield Road, Burnley, Lancs. 'Phone, 2375. Telegrams—2375.

Billcliff's Camera Works, Richmond Street, Boundary Lane, Manchester 15.

Bird, Graystone, 38, Milsom Street, Bath. 'Phone 3319. Telegrams—Bird, Photographer, Bath.

Boots Pure Drug Co., Ltd. (Photographic Department), Stamford Street, London, S.E. 1. 'Phone, Waterloo 4911. Telegrams—Regesan, Sedist, London.

Bowen's Camera Repair Service, Ltd., 114/115, Holborn, London, E.C. 1. 'Phone, Holborn 3126.

Bowler, Stanley W., 4, Majestic Mansions, 36a, Tottenham Court Road, London, W. 1. 'Phone, Museum 6483.

Bowyer-Lowe, N. J., 3, Commerce Lane, Letchworth, Herts. 'Phone, Letchworth 688.

Brinkman, E., Ltd., 343/345, Euston Road, London, N.W. 1. 'Phone, Museum 5217. Telegrams—Ozonized, Norwest, London.

British Cellophane Limited, 179, Tottenham Court Road, London, W. 1. 'Phone, Museum 2162. Telegrams—Cellophane, Rath, London.

British Commercial Gas Association, Gas Industries House, 1, Grosvenor Place, London, S.W. 1. 'Phone, Sloane 4554. Telegrams—Gasupreme, Knights, London.

British Journal of Photography, 24, Wellington Street, Strand, London, W.C. 2. 'Phone, Temple Bar 5330. Telegrams—Photometer, Rand, London.

British Optical Lens Co., Victoria Works, Summer Lane, Birmingham. 'Phone, Aston Cross 1156-1157-1158. Telegrams—Galalith, Birmingham.

British Photographic Industries, Ltd., 88/89, High Holborn, London, W.C. 1. 'Phone, Holborn 6900.

British Photographic Manufacturers' Association, Ltd., 104, High Holborn, London, W.C. 1. 'Phone, Chancery 8532.

British Sida Cameras, Ltd., 43, Bartholomew Close, London, E.C. 1. 'Phone, National 0432. Telegrams—Sidacamera, Cent, London.

British Thomson-Houston Co., Ltd., Rugby. 'Phone, 286. Telegrams—Asteroidal, Rugby. Crown House, Aldwych, London, W.C. 2. 'Phone, Temple Bar 8040. Telegrams—Asteroidal, Estrand, London.

Brook, Parker & Co., Ltd., Ashfield, Horton Road, Bradford. 'Phone, 8237. Telegrams—Broparco, Bradford.

Bruce's, Ltd., 28a, Broadway, Ealing, London, W. 5. 'Phone, Ealing 1033.

Burall Brothers, Ltd., Wisbech, Cambs. 'Phone, Wisbech 113. Telegrams—Burall, Wisbech.

Burr, Charles, 138, Wakefield Street, East Ham, London, E. 6.

Burroughs, Wellcome & Co., Snow Hill Buildings, London, E.C. 1. 'Phone, Central 4000. Telegrams—Tabloid, Cent, London.

Busch (Emil), Optical Co., Ltd., 36-38, Dean Street, London, W. 1. 'Phone, Gerrard 7194-5. Telegrams—Buschoptik, Rath, London.

Buzzard, L., Ltd., Cotswold Road, Bedminster, Bristol 3. 'Phone, Bristol 63118. Telegrams—Buzzard, Bristol.

Camera and Optical Exchange, 99 Waterloo Street, Glasgow, C. 2. 'Phone, Central 5447.

Camera Company, 320, Vauxhall Bridge Road, London, S.W. 1. 'Phone and Telegrams—Victoria 5482-5483; also 52, Cheapside, E.C. 2. 'Phone and Telegrams—City 5482.

Cameras, Ltd., 185, Liverpool Road, Slough, Bucks. 'Phone, Slough 929. Telegrams—Cameras, Slough.

Camerascopes, Ltd., 30, Percy Street, London, W. 1. 'Phone, Museum 8685.

Canadian Kodak Company, Limited, Toronto. Telegrams—Kodak, Toronto.

Cassio Photographic Paper Co., Ltd., Cassio Bridge, Watford, Herts. 'Phone, Watford 3482. Telegrams—Cassio, Watford.

Chance Brothers & Co., Ltd., Glass Works, Smethwick, near Birmingham. 'Phone, West Bromwich 1306. Telegrams—Chance, Smethwick. Scottish Works, Firhill, Glasgow. 'Phone, Maryhill 98. Telegrams—Brogan, Glasgow.

Chapman, J. T., Ltd., Albert Sq., Manchester 2. 'Phone, Blackfriars 8478-9. Telegrams—Camera, Manchester.

Church Army Lantern and Cinematograph Dept., 14, Edgware Road, London, W. 2. 'Phone, Paddington 9212. Telegrams—Landept, Padd. London.

Cinecraft Supplies, Ltd., Camera Corner, Palmers Green, London, N.13 'Phone, Palmers Green 0508.

Cinema Traders, Ltd., 26, Church Street, Charing Cross Road, London, W. 1. 'Phone, Gerrard 5287 and 5288. Telegrams—Biocinema, Rath, London.

Cinepro, Ltd., 1, New Burlington Street. London, W. 1. 'Phone, Regent 2085, Telegrams—Cinepro, Piccy, London.

Cinex, Ltd., 70, High Holborn, London, W.C. 1. 'Phone, Holborn 4482.

City Sale and Exchange (1929), Ltd., 84, Aldersgate Street, London, E.C. 1. 'Phone, National 0591. Telegrams—Retoucher, Barb, London; 90 to 94, Fleet Street, London, E.C. 4. 'Phone, Cen. 9391. Telegrams—Films, Fleet, London; 54, Lime Street, London, E.C. 3. 'Phone, Monument 0180. Telegrams—Phototypic, Led, London; The Arcade, Broad Street, London, E.C. 2. 'Phone, Bishopsgate 6799; 59, Cheapside, London, E.C. 2. 'Phone, City 1124.

Clay, S. & C., 105-107, Fowler Street, South Shields, Co. Durham.

Colourgraphs, 31, Goodge Street, London, W. 1. 'Phone, Museum 9670.

Colour Photographs (British & Foreign), Ltd., Victoria Road, Willesden, London, N.W. 10. 'Phone, Willesden 7300.

Compass Cameras, Ltd., 57, Berners Street, London, W. 1. 'Phone, Museum 5306-7. Telegrams—Compascam, Rath, London.

Construments, Ltd., 18, Gray's Inn Rd., London, W.C.1. 'Phone, Holborn 7507.

Cook, W. T., Ltd., Acme Photo Works, Chaldon Road, Upper Caterham, Surrey. 'Phone, Caterham 167. Telegrams—Rotaries, Caterham, Surrey.

Coronet Camera Co., 310, Summer Lane, Birmingham. 'Phone, Aston Cross 5804-5. Telegrams—Coronetcy, Birmingham.

Cotswold Publishing Co., Ltd., Wotton-under-Edge, Glos.

Criterion, Ltd., Criterion Works, Stechford, Warwickshire. 'Phone, Stechford 2007. Telegrams—Criterion, Stechford; 35, Essex Street, Strand, London, W.C.2. 'Phone, Central 2536.

Croxley Manufacturing Co., Dominion House, Bartholomew Close, London, E.C. 1. 'Phone, National 6135.

Dallmeyer, J. H., Ltd., 31, Mortimer Street, Oxford Street, London, W. 1. 'Phone, Museum 6022-3-4; Church End Works, Willesden, London, N.W. 10. 'Phone, Willesden 1621-2. Telegrams—Dallmeyer, London.

Detel Products, Ltd., Long Drive, Greenford, Middlesex. 'Phone, Perivale 1337. Telegrams—Detel,Phone,London.

Dickinson, John & Co., Ltd., Photographic Dept., Apsley Mills, Hemel Hempstead, Herts. 'Phone, Boxmoor 124. Telegrams—Dickinson, Apsley End.

Dixon, T. H., & Co., Ltd., Letchworth, Herts. 'Phone, Letchworth 666. Telegrams—Theko, Letchworth.

Dollond & Aitchison, Ltd., 192, Tottenham Court Road, London, W. 1. 'Phone, Museum 0852 (5 lines). Telegrams—Owl, London.

Doughtys, Ltd., 48, Savile Street, Hull. 'Phone, Central 31666. D. & P. Works, 141, Beverley Road, Hull. 'Phone, Central 7618.

Doulton & Co., Ltd., Lambeth, London, S.E. 1. 'Phone, Reliance 1241 (10 lines). Telegrams—Doulton, Lamb, London.

Dowty, E. F., Ltd., Walker Street, Blackpool, Lancs. 'Phone, Blackpool 2167. Cross Street, Windermere. 'Phone, Windermere 431, also Clarendon Road, Morecambe. 'Phone 398.

Dowty, Ltd., Castle Hill, Douglas, I.O.M. 'Phone, Douglas 199.

Drem Products, Ltd., 37, Bedford Street, Strand, London, W.C.2. 'Phone, Temple Bar 8858-9. Telegrams—Dremcorp, Lesquare, London.

Du Pont de Nemours & Co., Bush House, Aldwych, London, W.C. 2. 'Phone, Temple Bar 5565.

Dunscombe, M. W., Ltd., 5-7, St. Augustine's Parade, Bristol. 'Phone, 20793. Telegrams—Dunscombe, Opticians, Bristol.

Edgington, John & Co., Ltd., Sardinia House, Sardinia Street, Kingsway London, W.C. 2. 'Phone, Holborn 0734. Telegrams—Abri, Holb., London.

Elliott & Sons, Ltd., Barnet, Herts. 'Phone, Barnet 0011. Telegrams—Elliott, Barnet.

Empire Background Co., "Chez Nous," Chapel Road, Hesketh Bank, near Preston, Lancs.

Ensign, Ltd., Ensign House, 88/89, High Holborn, London, W.C. 1. 'Phone, Holborn 6900. Telegrams—Bromide, 'Phone, London. Works: Walthamstow, E. 17. Branches: 70/78, York Street, Glasgow. 'Phone, Central 4665-6. 10, Nelson Street, Swansea. 'Phone 4163. 3, Freeman Street, Moor Street, Birmingham. 'Phone, Midland 2695. 10, Best Lane, Canterbury. 'Phone, Canterbury 999. 18/19, Hills Terrace, Cardiff. 'Phone Cardiff 641. 38a, Queen Street, Belfast. 'Phone, Belfast 20656/7. Commerce House, Currinbhoy Road, Ballard Estate, Bombay. 10, Hungerford Street, Calcutta.

Ensign Snapshot Service, Victoria Road, Walthamstow, London, E. 17. 'Phone, Larkswood 2233 (2 lines). Telegrams—Ensiprin, Phone, London.

Epstein, J., & Co., Ltd., Mivart Street, Easton, Bristol 5. 'Phone, 57047. Telegrams—Mouldings, Bristol.

E.S.S. Colour Filter Co., Roughwood, Chalfont St. Giles, Bucks. 'Phone, Chalfont St. Giles 139.

Fairbrother, E. J., 7, Museum Street, London, W.C. 1. 'Phone, Temple Bar 3292.

Fallowfield, Jonathan, Ltd., 61-62, Newman Street, Oxford Street, London, W. 1. 'Phone, Museum 8318. Telegrams—Fallowfield, Rath, London.

Farrow, E. H., 84, Hazelville Road Hornsey Rise, London, N. 19.

Fasa (England), Ltd., Fasa Works, Sandridge Street, St. Albans, Herts.

Finlay Colour (London), Ltd., 174, Mill Lane, London, N.W. 6. 'Phone, Hampstead 6402. Telegrams—Fintocess, London.

Flatters & Garnett, Ltd., 309, Oxford Road, Manchester 13. 'Phone, Ardwick 3533. Telegrams—Slides, Manchester.

Fleming, R. A., & Co., Ltd., 32, Lord Street, Liverpool 2. 'Phone, Bank 819.

Fordham & Co., Ltd., Victoria Works, Victoria Road, Walthamstow, London, E. 17. 'Phone, Larkswood 1066 (3 lines). Telegrams—Permanent, Phone, London.

Fourdrinier, Hunt & Co., Ltd., 8, Chingford Mount Road, London, E. 4. 'Phone, Silverthorn 2241.

Fox Photos, 6, Tudor Street, London, E.C. 4. 'Phone, Central 7831-5. Telegrams—Foxfotopic, Fleet, London.

Fox, R., Ltd., 14/24, Britannia Street, King's Cross, London, W.C. 1. 'Phone, Terminus 6381.

Fry, S. H., 5, Highbury Grove, London, N. 5. 'Phone, Canonbury 2400. Telegrams—Fry, Can. 2400.

Gandolfi, Louis & Sons, 2, Borland Road, Stuart Road, Peckham Rye, London, S.E. 15. 'Phone, New Cross 1640.

Garner & Jones, Ltd., Polebrook House, Golden Square, London, W. 1. 'Phone, Gerrard 2300. Telegrams—Gerrard 2300, London.

Garratt & Atkinson, Warwick Works, Ealing, London, W. 5. 'Phone, Ealing 1871. Telegrams—Atkingarr, Phone, London.

Gasparcolor, Ltd., 3, St. James's Square, London, S.W. 1. 'Phone, Whitehall 8701-2. Telegrams—Gasparcol, Piccy, London.

G. B. Equipments, Limited, 142-150, Wardour Street, London, W.1. 'Phone, Gerrard 9292. Telegrams—GeBescope, Rath, London.

Gear, John H., 8, Nottingham Terrace, Marylebone Road, London, N.W. 1. 'Phone, Welbeck 2204.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C. 2. 'Phone, Temple Bar 8000. Telegrams—Electricity, Westcent, London.

Gevaert, Ltd., 115, Walmer Road, North Kensington, London, W. 10. 'Phone, Park 4333 (2 lines). Telegrams—Artoveg, Nottarch, London.

Gibson, C. M., 7, Kirby Street, Hatton Garden, London, E.C. 1. 'Phone, Holborn 0800.

Gilby & Herrmann, Ltd., 7-8, Plumtree Court, Farringdon Street, London, E.C. 4. 'Phone, Central 1201-2. Telegrams—Gilinkby, Phone, London.

Glanvill, H. G., 256, Balsall Heath Road, Birmingham. Telegrams—Calthorpe 2007.

Gorse, Edwin, 86, Accrington Road, Blackburn, Lancs. 'Phone, 6918. Telegrams—Gorse 6918, Blackburn.

Graber, Ellis, 16, Newton Road, Tunbridge Wells. Telegrams—Graber, Tunbridge Wells.

Grant, Thos. K., Ltd., Polebrook House, Golden Square, London, W. 1. 'Phone, Gerrard 2300. Telegrams—Gerrard, 2300, London.

Greeff, R. W., & Co., Ltd., Thames House, Queen Street Place, London, E.C. 4. 'Phone, Central 6550. Telegrams—Greeff, Cannon, London.

Green, A. W., 70, High Holborn, London, W.C. 1. 'Phone, Chancery 7004. Telegrams—Green, Chancery 7004.

Greenwood, Henry & Co., Ltd., 24, Wellington Street, Strand, London, W.C. 2. 'Phone, Temple Bar 5330. Telegrams—Photometer, Rand, London.

Griffin & Tatlock, Ltd., Kemble Street, Kingsway, London, W.C. 2. 'Phone, Temple Bar 2621. Telegrams—Gramme, Westcent, London.

Griffiths Bros. & Co. (London), Ltd., Macks Road, Bermondsey, London, S.E. 16. 'Phone, Bermondsey 1151. Telegrams—Aquol, Phone, London.

Griffiths, R., 26-31, Eyre Street Hill, Holborn, London, E.C. 1. 'Phone, Clerkenwell 5867. Telegrams—Eyragrif, Holb., London.

Guiterman, S., & Co., Ltd., 35 and 36, Aldermanbury, London, E.C.2. 'Phone, Metropolitan 8074. Telegrams—Guiterman, Phone, London.

Gulliman, Granville & Co., Ltd., 29, Warwick Place, Leamington Spa. 'Phone, 847. Telegrams—Granville, Leamington. 13, Gray's Inn Road, London, W.C. 1. 'Phone, Holborn 5688.

Halden, J., & Co., Ltd., 8, Albert Square, Manchester. 'Phone, Heaton Moor 2241 and 2242. Telegrams—Halden, Manchester.

Hall, B. J., & Co., Ltd., Stourton House, Dacre Street, London, S.W. 1. 'Phone, Whitehall 5302-6. Telegrams—Inspect, Sowest, London.

Halliday, C. H., & Co., Ltd., Holbeck New Mills, Holbeck Lane, Leeds. 'Phone, Leeds 22251. Telegrams—Halmac, Leeds.

Hamel, E., & Co., Premier Studios, Palmerston Street, Woodborough Road, Nottingham. 'Phone, 41547 (2 lines). Telegrams—Hamel, Nottingham.

Harbutt's Plasticine, Ltd., Bathampton, Bath. 'Phone, 8209. Telegrams—Plasticine, Bath. London Office and Showroom, 56, Ludgate Hill, E.C. 4. 'Phone, City 7362.

Hardtmuth, L. & C. (Gt. Britain), Ltd., Koh-i-noor Factory, Stafford Road, Croydon. 'Phone, Croydon 5185.

Harper Automatic Machine Manufacturing Co., Ltd., Automatic Works, Stafford Road, Croydon. 'Phone, Croydon 5571.

Harrap, John & Son, 3, Holborn Buildings, Holborn Bars, London, E.C. 1. 'Phone, Holborn 2020. Telegrams—Harsonart, Smith, London.

Harringtons, Ltd., 386, George Street, Sydney, N.S.W.; also Katoomba, Newcastle, Melbourne, Brisbane, Adelaide and Perth, Australia. Cables—Harrington, Sydney.

Haseler, Charles & Son, Ltd., 390-395, New John Street West, Birmingham 19. 'Phone, Telegrams—Aston Cross 0631, Birmingham.

Hathernware, Ltd., Loughborough, Leicestershire. 'Phone, Hathern 261. Telegrams—Bricks, Loughborough.

Heaton, Ltd., Wallace, 127, New Bond Street, London, W. 1. 'Phone, Mayfair 7511 (8 lines); also 47, Berkeley Street, W. 1. 'Phone, Grosvenor 2691, and 43, High Street, Kensington. 'Phone, Western 3223. Telegrams—Zodellaria, Wesdo, London. Works and Studios, 1a, Avery Row, London, W. 1. 'Phone, Mayfair 7511—Extension 21-24.

Heatrae, Ltd., Heatrae Works, Norwich. 'Phone, Norwich 3491. Telegrams—Heatrae, Norwich.

Hewittic Electric Company, Ltd., Walton-on-Thames, Surrey. 'Phone, Walton-on-Thames, 762, 763. Telegrams—Hewittic, Walton-on-Thames.

Higgins, C. M., & Co., Ltd., 16-20, Farringdon Avenue, London, E.C. 4. 'Phone, Central 3763. Telegrams—Plicated, Fleet, London.

Hilger, Adam, Ltd., 98, Kings Road, Camden Road, London, N.W. 1. 'Phone, Gulliver 5426. Telegrams—Sphericity, Phone, London.

Hirst, Brooke & Hirst, Ltd., Sheepscar Works, Leeds 7. 'Phone, 31155. Telegrams—Hirst, Leeds.

Hockett, S. W., Photographic Works, Potters Road, New Barnet, Herts. 'Phone, Barnet 0158.

Holmes Brothers (London), Ltd., Holbro Works, Billet Road, Walthamstow, London, E. 17. 'Phone, Larkswood 1086 (4 lines). Telegrams—Dogfish, Phone, London.

Home Cine-Cameras, Ltd., 18, Gray's Inn Road, London, W.C. 1. 'Phone, Holborn 7507.

Hood & Co., Ltd., Sanbride Works, and 97, Albert Road, Middlesbrough. 'Phone 2518. Telegrams—Sanbride, Middlesbrough.

Hora, Tudor T., 9, Geraldine Road, Wandsworth, London, S.W. 18. 'Phone, Battersea 0940.

Horne's Camera Mart, 58, Old Broad Street, E.C. 2. 'Phone, London Wall 3001; and 32, Gracechurch Street, London, E.C. 3. 'Phone, Mansion House 6880.

Houghton, C., 28, Russell Street, Heaton Park, Manchester.

Houghton-Butcher Manufacturing Co., Ltd., Fulbourne Road, Walthamstow, London, E. 17. 'Phone, Larkswood 1081. Telegrams—Rhamnus, Phone, London.

Howell, Charles, Owl Works, Bonny Street, Blackpool.

Howorth, H. E., Ltd., 43, Victoria Street, Fleetwood, Lancs. 'Phone, Fleetwood 557. Telegrams—Howorth 557 Fleetwood.

Hughes, W. C., & Co., 132, Englefield Road, Essex Road, London, N. 1. 'Phone, Clissold 1122.

Hunter, R. F., Ltd., Celfix House, 51, Gray's Inn Road, London, W.C. 1. 'Phone, Holborn 7311-2. Telegrams—Buxhunter, Holb., London.

Hunter-Penrose, Ltd., 109, Farringdon Road, London, E.C. 1. 'Phone, Clerkenwell 6626. Telegrams—Huntomatic, Smith, London. 69, Charlotte Street, Birmingham. 'Phone, Central 7427. 45a and 47, Market Street, Manchester, 'Phone, City 2169; 349, Cathedral Glasgow. 'Phone, Bell 1405.

Ilford Limited, Ilford, London. 'Phone, Ilford 3000 (20 lines). Telegrams—Plates, Phone, Ilford. Works, Ilford and Brentwood, Essex, Park Royal, Willesden Junction, N.W. 10, Watford, Herts; Mobberley, Cheshire. Ilford Galleries and London Depot, 101, High Holborn, W.C. 1. 'Phone, Chancery 8532; Cine Sales Dept., National House, 60-66, Wardour Street, W. 1. 'Phone, Gerrard 2763. Telegrams—Seloservs, London; Radiographic Dept., Tavistock House North, Tavistock Square, W.C. 1. 'Phone, Euston 2251; 3, Cadogan Street, Glasgow, C. 2. 'Phone, Central 7511; 16, Park Place, Leeds. 'Phone, Leeds 25320; 22, Lloyd Street, Albert Square, Manchester. 'Phone, Blackfriars 8512; 18, Oxford Street, Newcastle-upon-Tyne. 'Phone, Newcastle 25877; 22, Upper Ormond Quay, Dublin. 'Phone 21883; 4, Livery Street, Birmingham. 'Phone, Central 6819.

Illustra Enterprises, 159, Wardour St., London, W. 1. 'Phone, Gerrard 6889.

Imperial Chemical Industries, Ltd., Millbank, London, S.W. 1. 'Phone, Vic. 4444. Telegrams—Impkemix, Telex, London.

Imperial Dry Plate Co., Ltd., Ilford, London. 'Phone, Ilford 3000 (20 lines). Telegrams—Impeople, London.

Infallible Exposure Meter Co., Wrexham. 'Phone, Coedpoeth 26. Telegrams—Infallible Exposure, Coedpoeth.

Ipa Photographics, 8, 10 & 12, Lambeth Palace Road, London, S.E. 1. 'Phone, Waterloo 5312-3. Telegrams-Barlassoff, Lamb, London.

Janovitch, M., & Co., 19, Broad Street, Golden Square, London, W. 1. 'Phone, Gerrard 2202. Telegrams—Gerrard 2202 London.

Jeffery & Boarder, 55 and 56, Mattock Lane, West Ealing, London, W. 13. 'Phone, Ealing 0875.

Jepson, Warren & Co., Regent Works, off Hyde Park Road, Leeds. 'Phone, 26294. Telegrams—Jepson, Regent Works, Leeds.

Johnson & Sons, Manufacturing Chemists, Ltd., Hendon, London, N.W. 4. 'Phone, Hendon 8051 (4 lines). Telegrams—Caustic, London. Manchester Office, 12, Queen Street, Deansgate. 'Phone, Blackfriars 0115. Telegrams—Caustic, Manchester.

Johnson & Sons, Smelting Works Ltd., Creek Works, Brimsdown, Middlesex. 'Phone, Enfield 1677 (3 lines). Telegrams—Cauterism, Enfield.

Johnson, Matthey & Co., Limited, 73/83, Hatton Garden, London, E.C. 1. 'Phone, Holborn 6989. Telegrams—Matthey, Smith, London.

Johnson, Wm., & Sons (London), Limited, 289/299, Borough High Street, London, S.E. 1. 'Phone, Hop 1485.

Jones, Samuel & Co., Ltd., Bridewell Place, London, E.C. 4. 'Phone, Central 6500. Telegrams—Noncurling, Lud, London.

Kalton, G., 61, Farringdon Road, London, E.C. 1. 'Phone, Holborn 2763. Telegrams—Holborn 2763.

Kamy, Ltd., 22, Bunhill Row, London, E.C. 1. 'Phone, National 1508.

Kandem Electrical, Ltd., 769, Fulham Road, London, S.W. 6. 'Phone, Fulham 2387-9. Telegrams—Kortmath, Walgreen, London.

Kaufmann, Simon, Tottenham Mews, Tottenham Street, London, W. 1. 'Phone, Museum 1601 and 1602.

Kay Photo Machines, Ltd., 22, Bunhill Row, London, E.C. 1. 'Phone, National 1508.

Keen, Allan P., & Co., Ltd., 19, Cannon Hill Road, Coventry.

Kentmere, Ltd., Staveley, Westmorland. 'Phone, Staveley 65. Telegrams—Kentmeres, Staveley, Westmorland.

Kershaw, A., & Son, 200, Harehills Lane, Leeds. 'Phone, Chapeltown 41081-2. Telegrams—Science, Leeds.

Kingsway Electrical Services, 54, Bloomsbury Street, London, W.C. 1. 'Phone, Museum 3566.

Klix, Ltd., 131, Regent Street, London, W. 1. 'Phone, Regent 1000.

Kodak, Limited, Kingsway, London, W.C. 2. 'Phone, Holborn 7841. Telegrams—Kodak, London. Works, Wealdstone, Middlesex. 'Phone, Harrow 0080. Telegrams—Kodak, Wealdstone; 70, Lord Street, Liverpool. 'Phone, Bank 3563/4. Telegrams—Kodak, Liverpool; 46, Buchanan Street, Glasgow. 'Phone, Bell 1060. Telegrams—Kodak, Glasgow; 110, Grainger Street, Newcastle-on-Tyne. 'Phone Central 21663. Telegrams—Kodak, Newcastle-on-Tyne; 45, Corporation Street, Birmingham. 'Phone, Central 7966. Telegrams—Kodak, Birmingham; 89, Grafton Street, Dublin. 'Phone, Rathmines 91798-9. Telegrams—Kodak, Dublin.

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Kodak (East Africa), Ltd., Zebra House, P.O. Box 28, Nairobi. Branches:—Kenya Colony: Kitale, Eldoret, Nakuru and Mombasa; Uganda: Kampala and Jinja; Tanganyika: Dar-es-Salaam, Arusha and Tanga.

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Kodak (Egypt) S.A., Cairo. Branches: Alexandria (Egypt), Haifa (Palestine), Beirut (Syria), Instanbul (Turkey), Athens (Greece).

Kosmos Photographics, Ltd., Letchworth, Herts. 'Phone 128. Telegrams—Kosmos, Letchworth; also 155, Victoria Street, London, S.W. 1. 'Phone, Victoria 2685.

Lancashire Ferrotype Co., Masonic Hall Buildings, Adelaide Street, Blackpool, Lancs.

Lancaster, J., & Son, Ltd., 54, Irving Street, Birmingham 15. 'Phone, Midland 0372.

Lechertier, Barbe, Ltd., 95, Jermyn Street, London, S.W. 1. 'Phone, Whitehall, 2938. Telegrams—Lechertier, Piccy, London.

Leigh, L. A., & Co., 179, West End Lane, London, N.W. 6. 'Phone, Maida Vale 7902.

Leitz, E. (London), 20, Mortimer Street, London, W. 1. 'Phone, Museum 3776-7. Telegrams—Microtome, Phone, London.

Lethaby, W., & Co., Leda House, 124-132, Clerkenwell Road, London, E.C. 1. 'Phone, Clerkenwell 5004.

Lewis, R. G., 202, High Holborn, London, W.C. 1. 'Phone, Holborn 4780.

Lizars, J., 101-107, Buchanan Street, Glasgow. 'Phone, Central 8062. 381, Sauchiehall Street, Glasgow. 'Phone, Douglas 1669. Telegrams—Lizars, Glasgow; Factory, Glasgow; 6, Shandwick Place, Edinburgh. 'Phone 22272. Telegrams—Optical, Edinburgh; 118, Union Street, Aberdeen. 'Phone, 2324. Telegrams—Lizars, Optician, Aberdeen; 71, Bold Street, Liverpool. 'Phone, Royal 1882. Telegrams—Lizars, Optician, Liverpool; 27, High Street, Paisley. 'Phone 2238. Telegrams—Lizars, Optician, Paisley; 14, West Blackhall Street, Greenock. 'Phone 877. Telegrams—Lizars, Optician. Greenock; 12, Muir Street, Motherwell. 'Phone 68. Telegrams—Lizars, Optician, Motherwell; 8, Wellington Place, Belfast. 'Phone, 26992. Telegrams—Lizars, Belfast.

Lockyer, J. E., Ltd., 244, Evelyn Street, Deptford, London, S.E. 8. 'Phone, New Cross 0596.

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L.C.C. School of Photo-Engraving and Lithography, Bolt Court, Fleet Street, London, E.C. 4. 'Phone, Central 4153.

L.C.C. Trade School (Photographic Department for Women and Girls), Queen Square, Bloomsbury, London, W.C. 1. 'Phone, Holborn 4627.

London Instrument Co., Ltd., 51a, Bridge Street, Cambridge. 'Phone, Cambridge 4443. Telegrams—Cambridge 4443.

London Pharmacists' D. & P. Service, Ltd., Nightingale Grove, Hither Green, London, S.E. 13. 'Phone, Lee Green 5023.

London Photographic Co., Ltd., 269, Kingston Road, Merton, London, S.W. 19. 'Phone, Liberty 3311.

Lord's Camera Works, Wardleworth, Rochdale. Telegrams—Camera Works, Rochdale.

Lumex, Ltd., Dame Lane, Dublin. 'Phone, Dublin 22736. Telegrams—Lumex, 22736 Dublin.

Luminos Limited, 22, Bartlett's Buildings, Holborn Circus, London, E.C. 4. 'Phone, Central 1821. Telegrams—Central 1821, London.

Mackenzie & Co., 212, Old Dumbarton Road, Glasgow. 'Phone, Western 613. Telegrams—Daylight, Glasgow.

MacLeod, Angus M., 43, Rathgar Avenue, Ealing, London, W. 13. 'Phone, Ealing 1387.

Mallinson, Rufus H., 7, Rose Crescent, Cambridge.

Manchester College of Technology (Department of Printing and Photographic Technology), Sackville Street, Manchester. 'Phone, Central 3624. Telegrams—Printing, Technology, Manchester.

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Marion & Foulger (1933), Ltd., Magna Works, Bedford. 'Phone, Bedford 3261.

Marshall & Co. (Nottingham), Ltd., Ford Street, Nottingham Road, Nottingham. 'Phone 75386. Telegrams—Marshall, Photo, Nottingham.

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Mason, Thos. H., & Sons, Ltd., 5-6, Dame Street, Dublin, C. 1. 'Phone 52191-2 (two lines). Telegrams—Mason, Dublin 52191.

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Mawson & Swan, Ltd., Teams Works, Gateshead, Co. Durham, and 13, Mosley Street, Newcastle-on-Tyne. 'Phone Dunston 84144. Telegrams—Mands, Newcastle-on-Tyne.

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Merrett & Co., Trowbridge, Wilts. Telegrams—Merrett, Trowbridge.

Middlemass & Co., Ltd., Islington Wharf, Penryn, Cornwall. 'Phone, Penryn 137. Telegrams, Middlemass, Penryn.

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Schneider, R. E., 46, Farringdon Street, London, E.C. 4. 'Phone, Holborn 1167.

School of Commercial and Illustrative Photography (David Charles), 145, Queen's Road, Wimbledon, London, S.W. 19.

School of Pictorial and Technical Photography (John H. Gear), 8, Nottingham Terrace, Regent's Park, London, N.W.1. 'Phone, Welbeck 2204.

Scrivens, E. L., & Co., Ltd., 60. Queen's Road, Doncaster. 'Phone 559. Telegrams—Scrivens, Doncaster 559.

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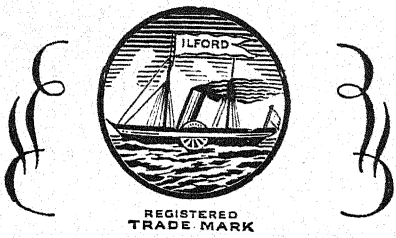
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